

ROADS AND STREETS

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Fig. 1 (left)—Church St. in June, 1927. Fig. 2 (right)—The New Church St. under Construction

Reconstructing an Important **NEW YORK THOROUGHFARE**

Recent subway construction made possible new Manhattan Island heavy-traffic artery. Methods used in laying wide granite-block pavement on concrete base

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IT is seldom in the planning and projecting of great public improvements that one fundamental, primary improvement virtually makes possible and paves the way for an equally fundamental, primary improvement. An exception to this general rule occurred in the case of the Eighth Ave. subway, now rapidly nearing completion, and the Church St. widening with its merging into Sixth Ave. extension, also nearing completion, in New York City. Manhattan Island has always presented a traffic problem because of its elongation. The island is 2 miles wide by 13 miles long and entirely surrounded, except at its northern end, by very wide and deep, swift-running tidal estuaries, the navigation of

which is difficult enough but the bridging and tunneling of which present problems that have called into use the best engineering brains in the world. Coupled with all this are the controlling circumstances that all the business is done in the lower 3 miles and the vastly greater part of the residential district is in the last 6 miles or beyond, leaving as it were a neutral or dead zone of about 4 miles through which human merchandise and food traffic must be carried without remunerative stop. Also immensely greater is the amount of business of all kinds, necessitating traffic of every description, which is done west of Broadway and this in spite of the fact that this portion of the island is narrower than the

easterly section. Tremendous, therefore, is the advantage which will permit even for comparatively short distances the opening up of a new wide through-traffic connecting artery, as is the case with Church St.

This street, a continuation of Trinity Pl. runs naturally from Morris St. to Canal St. a distance of about $1\frac{1}{2}$ miles; from Morris St. to Fulton St. it has for years been 60 ft. wide, a fair traffic width for a street which is one of four north-and-south traffic lanes



Fig. 3—Subgrade Excavation



Fig. 4—Excavation with Grab-Bucket



Fig. 5—Fine-Grading Gang



Fig. 6—Concreting of Base



Fig. 7 (left)—Laying Granite Blocks, 48 Hours after Laying of Concrete Base

Fig. 8 (above)—Cushion Mixer



Fig. 9—Typical Section of Granite-Block Pavement, Ready for Bituminous Filler



Fig. 10—Automatic Machine Mixing Filler



Fig. 11—Drawing Off Filler into Legless Barrow



Fig. 12—Supply Tank Charging Contractor's Tank



Fig. 13—Applying Filler to Blocks

lying west of Broadway to carry all the traffic in this great business, produce and water-freight district. At Fulton St., however, and in the area where W. Broadway, Varick St. and Hudson St. must be added to the north-and-south lanes, Church St. narrowed to hardly more than a lane—the roadway 15 to 18 ft. wide with 8

to 10-ft. sidewalks—and proceeded thus to its termination at Canal St.

Subway Construction Allowed Widening.—In Fig. 1 Church St. is shown in June, 1927, from about the Fulton St. intersection to Canal St., and it can be plainly seen from the width of the vehicles that three lanes of

traffic were difficult to maintain. However, at this time the Eighth Ave. subway was under construction and soon the buildings on the west side of Church St. from White St. to Fulton St., for a depth west of the existing house line of approximately 100 ft., depending on the depth of the property, were torn down, thus making possible the new Church St., from Fulton St. to White St., with a roadway width of 60 to 65 ft. and a total width of about 90 ft.

In Fig. 2 the new Church St. is seen after being temporarily repaved by the subway contractor and before work had been begun by the repaving contractor. In the background of Church St. may be seen the old Church St. between White and Canal streets and the buildings on the west side lying across the path of the new Church St. Because of legal difficulties, these buildings blocking the widening of Church St. for three blocks will not be demolished until 1931. As a sign of the progress in building the city which constantly calls for the most active use of brain and brawn in sewer and highway design and construction, contrast Fig. 1 and Fig. 2, taken just three years apart, and realize that this has been going on all over this city south of 59th St. It is at this point that the Sixth Ave. extension roadway, running south from Carmine St., acting as a roof for the Eighth Ave. subway and also a great connecting artery between the west-side traffic lanes uptown and the downtown traffic lanes of W. Broadway, Church St. and the east-and-west streets, enters Church St. at an angle of about 45 deg. making a continuous 60-ft. roadway for about 2½ miles through the heaviest vehicle-traffic area in New York.

The work of repaving Church St. from Fulton St. to Canal St. was awarded to the Sicilian Asphalt Paving Co., New York, N. Y., among the pioneers in repaving work in the city. The work started in August, 1930, and has progressed very rapidly, going on with unusual skill in the methods of procedure, the workmanship being of the highest grade and the supervision of the contractor's and the city's forces characterized by vision

and a realization of the needs of the adjacent business community.

Grading and Concrete Base.—The first point of attack was the removing of old curb and redressing and resetting of old or setting of new curb; simultaneously with this proceeded the work of laying the new sidewalk. As the curb advanced from block to block, laborers excavated the old block laid by the subway contractor, putting it in trucks to be returned to the subway contractor, claimed by the Division of Maintenance or, if useless to either, hauled to dumps. Then came the excavation of the subgrade (a typical area being shown in Fig. 3) to proper elevation, roughly by the Brown-hoist type of grab-bucket as shown in Fig. 4, to be followed by the fine-grading gang as shown in Fig. 5. Following hard on this came the road roller shown in Fig. 3, to compact the sub-base for the reception of the concrete base. Following the grading operation—sometimes within less than 200 ft. (see Fig. 6) came the concreting of the roadway base, laid to a thickness of 9 in. The mixer employed was the very latest type of Ransome, with self-contained power, capable of producing a yard of mixed concrete every minute. Note the wagon with the separate sand and stone individual mix charges separated by batter boards; there were eight charges in this wagon, automatically measured at the material yard but constantly checked and the checkings recorded by the city inspector. Because of the exigencies attendant upon the way in which the work was of necessity carried on, this mixer never reached its capacity; however, the contractor often reached an average of 400 cu. yd. a day.

Granite-Block Laying.—Forty-eight hours after the concrete base was laid came the granite-block laying (Fig. 7). These granite blocks, about 1,100,000 in number, 4 in. wide, 5 in. deep and 10 in. long, came from granite quarries in the vicinity of Rockland, Me., and were inspected on the barges in New York City before being released to the contractor. They were then trucked and dumped at the work in truckload piles as



Fig. 14—Completed Roadway, Photographed while Deserted by Traffic

needed. The sand and cement cushion was then mixed and spread 1 in. deep (see cushion mixer, Fig. 8) and on this the granite block was laid in straight courses from curb to curb with broken joints. The gangs consisted of three men on the sand and cement cushion, mixing and placing; six to seven pavers to a course with two to three helpers; also, three to four men acting as rammers and tongsmen. Generally there were two to three such gangs operating at once.

With every granite-block paving contract, a photograph is taken showing a typical section of granite block, laid and ready for the bituminous filler. The markings on the square in Fig. 9 are $\frac{1}{2}$ in. wide and are intended to show the comparative width and length of block and the width of joints. In this regard, it has been found that the photographs, because of the intense blackness of the shadows, exaggerate to the eye the apparent width of the joints. These photographs, on which the quarry and location are carefully recorded, are filed as records and from time to time comparisons between series of pavings are made.

Filler.—As the blocks are being laid, the sand and asphaltic content are being carefully mixed in the automatic mixing machine (Fig. 10). The large tank is a bitumen container from which the hot mixture is drawn into the sand mixer where the asphaltic content and the sand are mixed; from the small machine in Fig. 11 the filler is being drawn into a legless barrow; in Fig. 12 a supply tank is shown charging the contractor's tank. The hot filler is then dumped on the granite block in proper areas (Fig. 13) where it is quickly worked into the joints by the shallow-depth broad-bladed hoe. Over this bitumen filler very fine sand is sprinkled and the roadway paving is completed. In Fig. 14 is shown the completed roadway, purposely photographed early Sunday morning when the roadway was deserted. Notice the crowning of the roadway in the first block; also in the intersection in the foreground. The crowns in this work, on which good drainage so absolutely depends, are particularly good, especially at the intersections, and are a tribute to the care and attention of the transitman and inspector and the workmanship of the contractor.

Completion of Work.—It is matter of regret that the contractor did not have the entire area of his contract ready for work, but subway construction and legal delays prevented this. There yet remain the areas from Fulton St. to Barclay St. and from Leonard St. to White St., and the demolishing of buildings, filling in and grading and paving from White St. to Canal St., all of which work will be completed in 1931.

However, there has been opened up at this time for through-vehicle traffic a new artery at no point less than 60 ft. wide from Fulton St. to Carmine St., bringing tremendous relief to the heavily congested vehicle traffic of the downtown west side. Its promise made the change shown in Fig. 1 and Fig. 2; no inspired prophet can hope to dream what its fulfillment will mean.

GRADE CROSSING ELIMINATION IN PENNSYLVANIA.—During the first nine months of 1930 the Pennsylvania Department of Highways completed or placed under construction contracts for the elimination of 15 grade crossings, elimination of two grade separation structures and relocation, with consequent improvement of safety conditions, of 15 grade crossings. The total estimated cost of the work is \$2,526,468.81. Thirty-eight cases are pending before the Public Service Commission.

New Motion Pictures of Highway Construction

A new series of road-construction films, sponsored by the Bureau of Public Roads, U. S. Department of Agriculture, has just been released. They are for the use of highway engineers, road builders, engineering students, and others interested in better roads. These films replace films withdrawn from circulation because improvements in road making have made the old films obsolete.

"Mixed-in-Place Bituminous Surfaces," 2 reels, compares the bituminous treatment of crushed stone and gravel surfaces that use light road oil and small stone with the practice of using heavier road oil and larger stone. Most of the scenes were taken in Arizona, California, and Indiana. This film takes about 30 minutes to show.

"Penetration Bituminous Macadam," 1 reel, replaces the old film, "What About Macadam?" and pictures the construction of penetration bituminous macadam surfaces. The scenes were made in the New England States, where this type of road has been developed to a high degree, especially in Massachusetts and Rhode Island. This film takes 15 minutes to show.

"Hot-Mixed Bituminous Pavements," 1 reel, treats of the construction of bituminous concrete pavements, including sheet asphalt. Most of the scenes were photographed in California. It takes fifteen minutes to show this film.

The films show different methods that may be used under varying conditions. Though of a technical nature and designed primarily for road builders, the general public may learn much by seeing the films and will better appreciate the good roads over which they ride in their automobiles.

Borrowers of these films should apply to the Office of Motion Pictures, U. S. Department of Agriculture, Washington, D. C. Like all the department's films, they are loaned free of charge, the borrower paying only transportation charges to and from Washington. Films may be borrowed for one showing; or for a series of showings provided arrangements are made sufficiently far in advance. Schools, colleges, or organizations may purchase any of the department's films practically at cost. Many institutions avail themselves of this opportunity, as the number of copies for free distribution is limited. Foreign governments and State Highway Departments have been frequent purchasers of the department's road-construction films.

Quebec and Nova Scotia Attack Dust Nuisance

In Quebec the department of highways has paid particular attention to the question of eliminating dust on main gravel roads in the province, especially within the limits of villages and towns. Calcium chloride is widely used on roads with heavy traffic and in the towns and villages. Contracts have been granted for laying bituminous coat with funds available from the permanent paving program. Some 26 villages are being treated in Quebec in this manner with an average length of about 1 mile per village. The government of Nova Scotia also plans to set aside \$100,000 for the purpose of removing the dust nuisance on highways in that province.

Variety Shown in Views of California



Portland-Cement Concrete Pavement, 56 Ft. Wide, Near Whittier, Los Angeles County

Pictures from C. S. POPE

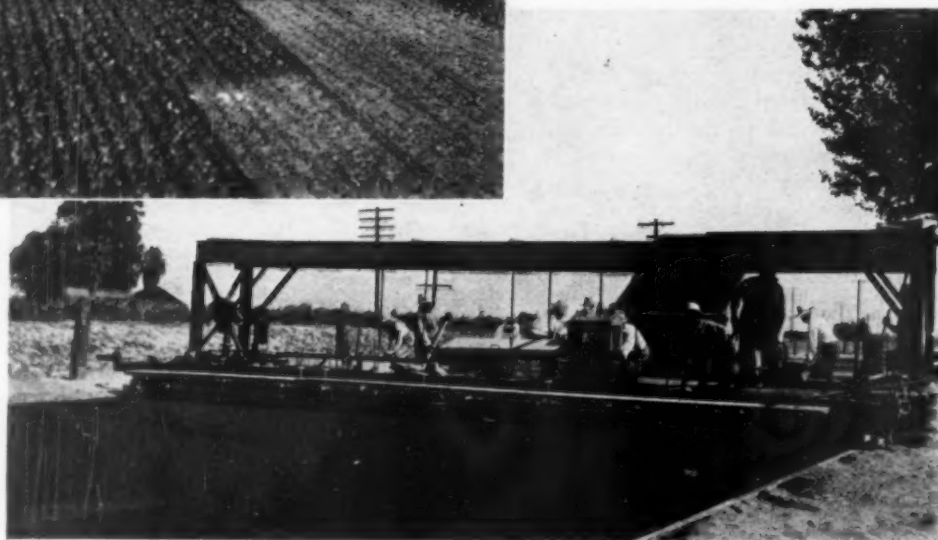
Construction Engineer, California Division of Highways, Sacramento, Calif.

VARIED types of surfaces and varying aspects of terrain contribute to the interest of these pictures from California. A noteworthy development is the 10-ton, 30-ft. mechanical spreader shown at work on an asphaltic concrete pavement in Fresno County.



Above — Asphaltic Concrete Pavement, 20 Ft. Wide, Being Constructed by Use of Mechanical Spreader; Monterey County, Near Salinas

Right — Asphaltic Concrete Pavement, 30 Ft. Wide, in Fresno County, Near Fowler. The Mechanical Spreader Is 30 Ft. Wide and of 10-Ton Capacity



Highways



Plant-Mix Oiled Rock Surface, 20 Ft. Wide, Near Summit of Cajon Pass in San Bernardino County, Between San Bernardino and Victorville



On the Redwood Highway in Humboldt County, Near Stephens Grove. Graded Width, 28 Ft.; Surfaced Width, 20 Ft.



Spreading Plant-Mix Oiled Rock Surface in Inyo County, Near Olancho



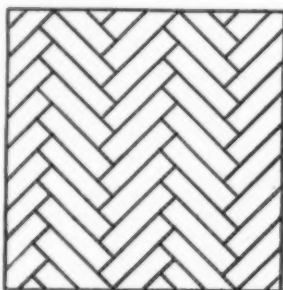
Left—Grading Kings River Highway by Use of Prison Labor, in Fresno County, East of General Grant National Park. Right—Another View of Oiled Rock Surface Near Summit of Cajon Pass

Notes on Foreign Road Construction

Interesting methods and devices described in reports submitted at the 6th International Road Congress at Washington, D. C.

New Bond for Laying Paving Brick

Formerly in constructing brick pavement in Holland the bricks always were laid with broken joints (common bond) with rows at right angles to the direction of the road. According to the report of the Holland group of engineers an improvement, the so-called Keper bond has been introduced recently. In this bond, as will be noted in the illustration, the rows of brick are laid in a herringbone pattern. The report states that this bond has certain advantages. The wheel comes on to the brick gradually, causing a better distribution of pressure. This bond, however, has the disadvantage that with brick of different lengths wide joints occur, that many broken bricks must be used at the sides of the road, and that the corners of the brick break off sooner. With bricks of the same size, however, this bond is preferable to the common bond.



Keper Bond for Laying Paving Brick

Machine for Determining Smoothness of Concrete Pavement

A special device for determining the irregularities or degree of finish of a concrete road surface is described in the report of the Italian engineers. The instrument, constructed by the Road Experimental Institute of Italy, is called a profilograph and is similar to a device used in this country. It consists of a frame mounted on 16 wheels arranged in such a way as to measure the unevenness of the road surface with respect to a central fixed point on the frame. At this point there is a vertical rod terminating in a small roller which follows the desired track on the pavement, rising and falling in correspondence with the unevenness of the road profile

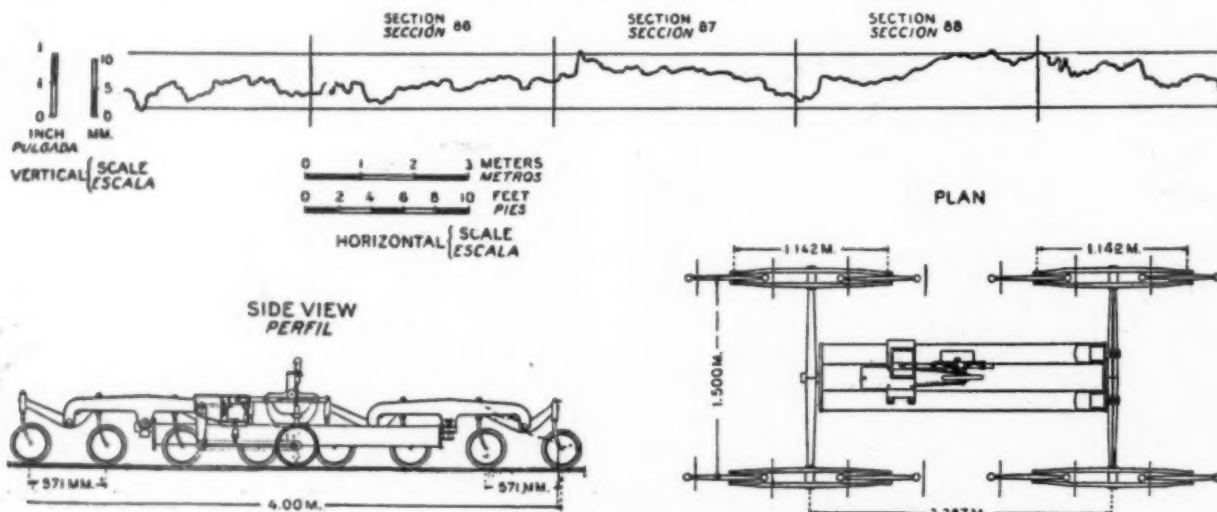
in respect to a middle straight line of reference. The vertical movements of the rod are amplified and transcribed on a strip of paper which unrolls at a speed lower than the speed of the instrument. By adjusting the ratio of speed of paper to speed of instrument and the ratio of amplification of the vertical movements of the rod, it is possible to obtain a ratio of ordinates to abscissae on the paper, varying between 10:1 and 400:1. This instrument will also be employed to observe the manner in which the wear of the concrete occurs, by combining the profiles with the levels taken at the fixed points of reference.

Resurfacing Old Block Pavement

A method of repairing old block pavements with bituminous emulsion was described as follows by E. Jeanin, Ingénieur en Chef des Ponts et Chaussées, Orleans, France:

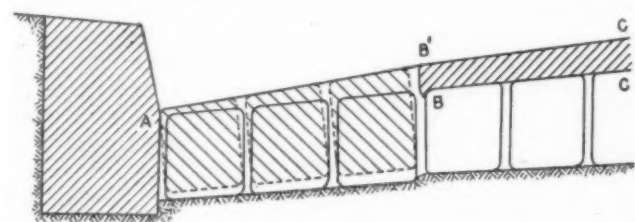
Certain block pavements are in such a condition that their defects can not be overcome by relaying block. It is natural to think of treating them as stone roadbeds, which may be improved by the use of cover material and bitumen emulsion. Those which have been repaired in this manner withstand traffic very well. The surface treatment, which is applied in the same manner as in the case of macadam, is preceded by a liberal washing with water, under pressure if possible, in order to clean out the joints well and remove from the surface of the pavement impurities of all sorts.

The repair of such a roadway requires a mean consumption of emulsion which varies from 0.5 to 2 liters per square meter of paving surface, according to the number of depressions in the pavement and the importance of obtaining an even surface. The expense is less than that of relaying the block. This process entirely eliminates the use of the specially skilled hand labor, which is required in relaying the block. There is the further advantage of rendering the repaired sections impermeable and thus avoiding further settling.



Scheme of Profilograph and Specimen of Profile Obtained

It should be recognized that a road repaired in this manner has a rather patched appearance, but this is a consideration rather unimportant to the users of the road, who demand only a surface of sufficient uniformity, which is obtained by this process with a minimum of expense.



A B C.....OLD BLOCK PAVEMENT
A' B'.....ALTERED PROFILE OF PAVING BLOCK IN GUTTER
B B'.....3 CENTIMETERS
B' C'.....SURFACE TREATMENT

Method of Rebuilding Gutter for Surface Treated Block Pavement

For reasons already indicated in the preceding paragraph, the highway authorities have recently avoided the laborious restoration of certain block pavements which were in very bad condition by covering them with surface treatments.

Several such experiments have been tried, one on National Highway No. 16 at Sarcelle (Seine et Oise) and two others on National Highway No. 20 at Chevilly and Olivet (Loiret). The latter two, with which we are especially familiar, have been carried on by stage construction during the three years from 1926 to 1928 and they are giving excellent results.

Rather than discuss the various processes tried in 1926, we will limit ourselves to a description of the method which has been followed recently as a result of the experience gained during the preceding years. This process includes four successive operations.

The first operation consists of shaping the surface of the paved roadway. This is done by filling the depressions with cover material and bitumen emulsion. The second operation consists of the application of the surface treatment proper, or main course. The pavement is washed with a jet of water under pressure, which cleans out the joints to a depth of 1 to 2 centimeters and rids the surface of the road of all earth and other impurities.

After the run-off or absorption of the water due to washing a general priming course of the bituminous material is spread at the rate of about $1\frac{1}{2}$ liters per square meter, and small crushed gravel, grading from 20 to 30 millimeters, is spread to a thickness of about 5 centimeters, or 50 liters, per square meter. After rolling with a light roller, cover material grading from 10 to 15 millimeters is thrown on at random. The surface is then rerolled to reduce the percentage of voids, spread with emulsion at the rate of 6 liters per square meter, and then covered with a light course of cover material.

The pavement thus constructed is well rolled. For all the rolling operations a total of about 10 ton-kilometers of rolling per cubic meter of cover material is required.

The third phase of the surface treatment consists of laying the middle or joining course. After some time, when traffic has produced its effect in imparting life to the pavement, it is covered, after an initial sweeping, with a new layer of emulsion, 2 liters per square meter, and then spread with cover material grading from 10 to 15 millimeters at the rate of 10 liters per square meter.

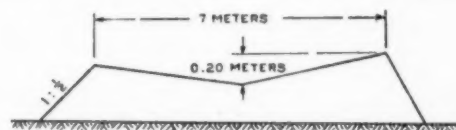
The final phase consists of laying the surface course. After sweeping, emulsion is spread at the rate of 1.5 liters per square meter, followed by sanding with coarse-grained sand at the rate of 5 liters per square meter.

In the whole operation, excluding the work of shaping the surface of the paved roadway, the following amounts of material are used for each square meter of road surface: 50 liters of cover material grading from 20 to 40 millimeters, 15 liters of material grading from 10 to 15 millimeters, 5 liters of coarse sand, and 11.5 liters of bitumen emulsion.

It often happens that the height of the edge of the sidewalk is such that it is not desirable to reduce it by as much as 3 centimeters, which is a minimum below which the thickness of the surface treatment should not go. If this is the case, it is only necessary to rebuild the gutter, using the old paving block, if desirable, and so arranging them that the desired displacement of 3 centimeters at the edge next to the sidewalk is obtained. The illustration shows a cross section of the gutter and the adjacent parts of the sidewalk and roadway before and after the surface treatment of the road.

Road Construction in Siam

How roads are constructed in Siam was described by Luang Prinyayogavibulga, of the Department of Ways, Bangkok, Siam, in his report. Although Siam has been, for a long time past, a fertile agricultural country, economic development with the consequent demand for roads has occurred only within recent times. In the construction of highways through new country the conditions are greatly different from those of Europe. In general, suitable maps can not be obtained. A detailed reconnaissance survey is therefore necessary.



Typical Cross Section of Road on Embankment

As Siam is generally flat, being an agricultural country, the highway consists mostly of embankments. The cross section that has been found suitable and has been widely adopted in this country is shown in the illustration.

Due to frequent heavy rains it has been found that a standard profile with a crown in the middle is most unsatisfactory, as the side slopes are soon damaged by the rushing rain water and a great deal of earth is washed away. By raising the sides 20 centimeters, thus forming rain banks, the rain water will be kept in the middle, seeping through the new earth and helping to compact it. In a year the new earthwork will be fairly compact, the subgrade can then be dressed to standard cross section with a crown in the center ready for metaling.

"Sandwich System" of Cement Bound Roads

A method of constructing a cement bound surface for roads of lighter traffic was described by the English engineers in their report on "results obtained by the use of cement." The method consists in spreading a layer of broken stone of 2-in. gage to half the required depth, say about 2 to 3 in., on a firm and hard foundation between timber forms or between concrete abutments previously provided. The stone may be given a light rolling to level it, care being taken not to give more than

one or two runs with the roller. Should the stone be very dry or dusty it must be sprinkled with water to prevent absorption, after which sand and cement mixed in the form of a plastic 2 to 1 mortar, is spread to the depth of 1 in. or more over the stone. Immediately thereafter the rest of the stone is spread over it to the proper depth, these stones also being damped if the weather is dry. After work has continued for an hour a sufficiently large area will have been laid for a roller, say of 8 tons weight, to commence operations upon it; the effect of the roller on this "sandwich" of stone and mortar is to squeeze the mortar downward and upward into the interstices of the stone. After 10 minutes or so of rolling the mortar begins to show on the surface and when this occurs the surface should be given a soft brushing. Rolling should be continued until the slurry has worked up and all raw patches have closed up. Rolling operations must be completed within one and one-half hours (two hours in winter) from the mixing of the mortar. Care must be taken that no wheel marks are left, and rather than overroll and run the risk of crushing the surface stones it has been found better to beat out the wheel tracks by means of a finishing board shaped to the required camber. To finish off the facework a timber balk should be spiked transversely and the roller worked over it; the following day the balk can be lifted and a consolidated vertical face is left to work from. The roller must not, of course, work over this joint on to the previous day's work. The surface requires to be cured in somewhat the same manner as described for an ordinary concrete road.

The cost of such a surface in England has been found to range from \$1.32 to \$1.68 per square yard for an average thickness of 4½ in. not including laying of the foundation. The report states that the method, though not very commonly used, has been successfully tried, and may be considered as well beyond the experimental stage.

Roads and Labor

Following is a reprint taken from the editorial columns of *Highway Topics* for October. It shows how the state authorities in Ohio are doing their bit to alleviate unemployment created by the business depression.

"For both business and humanitarian reasons, steps have been taken to continue improvement work in various lines during most of the winter season. The customary policy of 'letting up' until spring has been abandoned and many kinds of work have been planned for the winter months, prompted by encouragement and example of federal and state authorities. The state, many municipalities and most of the counties have undertaken numerous construction activities and intensive programs of repairs, alterations and clean-up are under way, with the result many idle men have been given employment and an impetus has been given to business.

"A large number of industries likewise have taken on a more encouraging attitude and are endeavoring to restore their operations to normal basis. Business men are realizing more than ever before that those who are irregularly employed cannot buy much and those who are out of work cannot buy at all; they are fast learning that if business is to be maintained everybody must be employed.

"Highway and street improvements are regarded as important activities in furnishing employment. The item of labor, according to experts, represents more than half of the expenditures for such purposes. This

means that if \$2,000,000,000 is spent for highways, which is the estimated highway bill for 1930, more than \$1,000,000,000 will go for employment of labor, represented in field work, preparation, manufacturing and applying materials, manning machinery and equipment, inspection, supervision and other necessary activities.

"The federal appropriation for roads has been increased from \$75,000,000 to \$125,000,000 and it is recommended that the appropriation be made \$250,000,000 in order to give greater encouragement to highway building. The state has set aside an additional fund of \$1,300,000 for maintenance and repair, particularly for use in those counties that were hardest hit by the drought, and all remaining gasoline and motor vehicle funds for use in municipalities, counties and townships have been made available for local expenditure, and a great many local officials are utilizing all possible finances toward relieving the unemployment situation. This policy on the part of public officials, business men and industries is fast creating a more hopeful prospect for the winter and the coming year."

Reporting Winter Road Conditions in Pennsylvania

Newspapers, radio broadcast stations, motor clubs, highway patrol and maintenance offices of the Pennsylvania Department of Highways are co-ordinated units of a carefully planned system to keep motorists posted during the winter on highway conditions during or following a snow storm. Authentic information sources are to be an established part of the snow removal program on some 10,000 miles of the state system.

The highway department maintains a publicity and information bureau with a staff of clerks at the service of motorists in need of any information pertaining to highways. This bureau publishes the weekly detour bulletin during the construction season and a winter bulletin marking the carry-over detours. The winter bulletin also outlines the highways on which traffic is to be maintained through snow removal and anti-skid treatment.

Because of constant changes in conditions during the winter a printed bulletin is impractical. In its place is a carefully planned system of keeping motorists informed hourly on road conditions.

The plan as outlined makes each of the 53 maintenance districts responsible for informing local residents. Newspapers and radio stations are to be furnished complete information as frequently as conditions require and at all hours. Each district will report to headquarters at Harrisburg, where the publicity bureau will collate the information, furnish it to metropolitan newspapers and press wires, and provide frequent bulletins for radio broadcast through a network of twenty stations.

Motor clubs, shippers, chambers of commerce or other interested agencies will be enabled to get complete information either from maintenance offices in the field or from headquarters at Harrisburg.

State highway patrolmen form an important link in the information system. Patrolmen riding the roads will report conditions they discover to proper highway authorities, who will immediately take steps to remedy them. This service will be especially valuable at night. During daylight hours regular caretakers of the department force will be on duty. Highway patrol stations will be sources of information for the public, each station covering its territory.

Road Crosses Swamp on



Driving Outer Row of Piling for Special Construction

Timber-Pile Foundation

CONSTRUCTION of a type uncommon in highway practice is being employed by the Illinois Division of Highways in providing a stable foundation for a short section of Mannheim Road, on Route 46, near Westchester, Cook County, Ill. This portion of the road passes through a low-lying section of peat bog, the unstable nature of which had caused the extensive and uneven settlement of a slab placed in 1926. The type of construction adopted to meet this condition consists of creosoted timber piling, capped by

longitudinal reinforced-concrete beams carrying a 40-ft. pavement slab.

The special construction begins at a point on Mannheim Road about 600 ft. north of the junction with Illinois Route 6, designated locally as Roosevelt Road, and extends to and includes the intersection, as indicated in Fig. 2. The bog extends on each side of the road for the greater portion of the special construction. Test pits adjacent to the intersection showed underlying strata approximately as follows: 6 ft. of gravel and clay, 2 ft. of peat, 15 in. of sand and clay and approximately 4 ft. of peat, followed by sand and peat mixed to an indefinite depth.

Foundation Design.—The pile-foundation construction for support of the 40-ft. slab is shown in Fig. 1. Three lines of piling were driven, one at each edge and one at the center of the pavement slab. The outer piles are spaced on 10-ft. centers; the center piles are spaced 5 ft. apart. The piles are creosoted-treated and have a minimum diameter of tip of 8 in., a minimum diameter 4 ft. from the butt of 12 in. and a maximum diameter of butt of 20 in. They vary in length from 32 to 42 ft. and are driven to a specified capacity of 18 tons.

The piles are capped by concrete beams 2 ft. by 2 ft. 6 in. in cross-section, reinforced by four $\frac{3}{4}$ -in. round bars top and bottom. The pile tops extend 9 in. into the concrete caps. The pavement slab is 40 ft. wide,

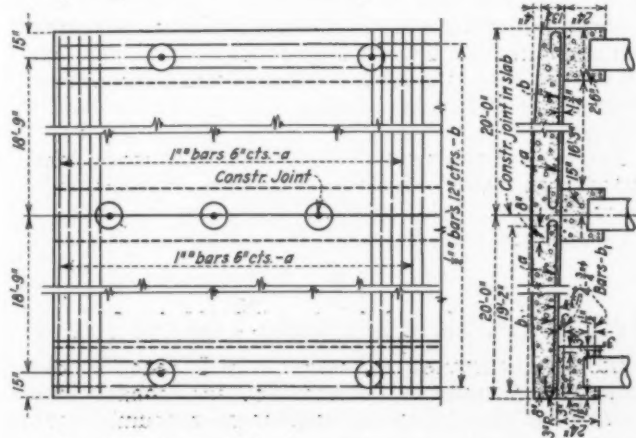
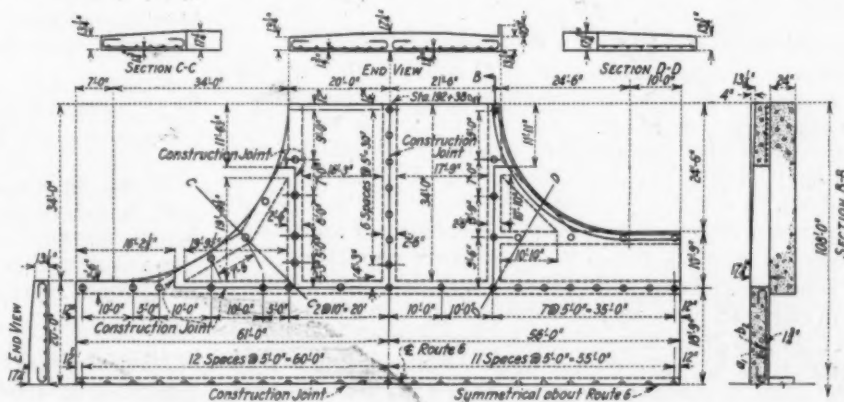


Fig. 1 (above)—Typical Construction, Special Section of Illinois Route 46

Fig. 2 (right)—Half-Plan of Intersection





Special Section with Most of Slab in Place and Covered with Straw. Center Beam in Foreground Has Just Been Poured

13¼ in. thick at the sides and 17¼ in. thick at the center. It is reinforced as shown in Fig. 1.

The arrangement of piles and capping at the intersection is shown in Fig. 2, in which details of reinforcing have been omitted. The slabs approaching the intersection from the south, east and west are not supported on piling. Concrete hubguards and an increased width of slab on Route 6 to the east, within the village of Westchester, are also indicated in the drawing. The piles supporting the intersection are 42 ft. in length.

A concrete box culvert, included within the special section, is supported on 28 piles. A standard 15-ft. bridge-approach section is provided at each end of the special construction.

Pile-Driving.—The piles were driven by a 2,570-lb. drop-hammer. Near the intersection a penetration of from 6 in. to 3 or 4 ft. per blow was secured for the first 24 ft. At one particularly soft spot a 10-ft. drop gave a penetration of 2 ft., and at another a pile sank 16 ft. into the ground under the weight of the hammer. With a 30-ft. drop an average penetration of 1¼ in. at the last blow was secured.

The contractor for this work is John Mackler & Co., Inc., Chicago Heights, Ill., for whom Fred Lawrence is superintendent. K. D. Avedisian is resident engineer for the state.

Motor Vehicle Fatalities Increase

Motor vehicle fatalities in the United States for the first nine months of this year were 2 per cent above the same period in 1929, which was by far the worst year since the automobile became a factor in our national accident record, according to the National Safety Council.

The report is based on figures representing areas containing about 50 per cent of the nation's population.

While the rate of increase this year does not compare with that of a year ago, it is discouraging in view of the fact that 1929 ended with an unprecedented rise of 13 per cent to a total of more than 31,000 deaths. It is impossible to estimate what the final total for this year

will be, but it is believed the increase will not reach the proportions of that of a year ago.

Fatalities for the first six months of the year were considerably above the same periods of 1929, but better records in more recent months have brought down the ratio.

Out of nine entire states reporting, eight had fewer deaths in September than in August. In eight states where September records were available for both years, seven had fewer fatalities this year than a year ago. In cities, school days brought the usual increase in September child accidents. Pedestrian deaths constituted 54 per cent of the total in September as compared with but 51 per cent in August. Exactly 100 more children were involved in street accidents in September than in August.

There were approximately two-thirds as many home fatalities as motor vehicle deaths in the 35 cities which reported both. Falls continue to lead as the cause of these domestic tragedies.

Roads Stimulate Mexican Tourist Travel

During the second quarter of 1930 the Mexican-American Automobile Association, in Laredo, Tex., documented the following number of automobiles for entry into Mexico for touring purposes, the number of tourists being calculated by multiplying the number of automobiles by four:

Month	Automobiles	Tourists
April	267	1,068
May	300	1,200
June	405	1,620
Total	972	3,888

These figures show that tourist traffic through this port is increasing steadily. Most of it is destined to Monterrey and Saltillo, and it is evident that many tourists will travel to Mexico City as soon as the highway throughout is in good condition.

New York was the first state to license motor vehicles, beginning in 1901, and collecting \$954 that year.

Snow Removal in Minneapolis

Snowfall statistics—Organization of snow-removal work—Equipment for plowing and mechanical loading—Parking and traffic conditions—Costs

By JAMES GARBERG

Superintendent of Streets, Minneapolis, Minn.

SNOW removal is a subject that is misinterpreted. To some it means merely plowing the roadway, but to the city street official it not only means the plowing of its streets but the removal and final disposal of the snow in various areas of the city.

Statistics.—The manner in which a city tackles its snow problems depends upon its climatic condition and the nature of the storm. The following statistics, applying to the city of Minneapolis, may possibly be used as a basis of comparison:

58.79 square miles of area
796 miles of dirt streets
237 miles of pavement
465,753 population
130,000 car registration (Jan. 1, 1930)

U. S. Weather Bureau statistics 1920-1930; snowfall of 3 in. or more:

Date of Snow	Amount In In.	December Temperature at Snowfall	Temperature 24 Hours After	Temperature 48 Hours After
12-21-30	5.3	20	20	10
12- 8-24	4.7	22	8	8
12- 4-26	3.6	15	10	10
12-13-26	3.5	— 2	—13	— 8
12- 3-27	3.8	4	12	24
12- 7-27	6.3	0	—10	— 7
12-15-27	5.3	13	— 2	2
12- 1-29	3.8	8	6	10
January				
1- 4-22	3.0	10	— 3	0
1-14-23	4.2	28	19	8
1-27-23	3.0	20	16	19
1- 9-24	3.8	24	16	10
1-19-26	4.0	14	4	— 3
1- 5-29	3.2	4	— 4	—10
1-22-29	4.5	4	—12	— 2
1-24-29	3.0	— 2	— 4	— 9
1-12-30	4.1	11	5	10
1-14-30	3.0	10	2	— 8
February				
2- 8-21	3.5	20	22	26
2-23-22	6.0	8	6	7
2-26-29	5.0	28	26	23
March				
3- 3-20	3.2	16	7	2
3-19-20	6.8	34	33	38
3-29-24	11.0	20	16	13
3- 6-26	4.0	24	10	14
3-20-27	3.0	26	32	29
3- 8-28	5.7	26	24	30

Organization.—All of the equipment is owned, operated and maintained by the equipment department and rented to functional activities on an hourly-rental basis during snow-plowing operations; this organization consists of an equipment repair foreman, sufficient mechanics to render services and keep the equipment rolling, equipment operators and two equipment dispatchers.

By glancing at Fig. 1 it will be noted that we divide our city into seven street snow-plowing divisions. To each one of these divisions from five to seven pieces of motor equipment are assigned under the supervision of a field foreman. Each piece of equipment is assigned a list of important primary streets in the numerical order in which they are to be plowed. These lists are made out in card form, one copy to the equipment operator and a copy to the field foreman.

The field foreman has no jurisdiction to change any routing on these primary streets without first getting permission from the street supervisor. Primary streets

on all the routes are so laid out that traffic will not have to travel more than one or two blocks to get to a plowed street that will take it to any place in the city. Approximately 3 hours after a normal snowfall these primary streets have all been plowed. After the primary streets have been plowed, the routing of equipment and the plowing of lesser important streets are left almost entirely to the judgment of the field foreman of each division, who keeps in close touch with the main office. Approximately 6 hours after the snowfall all primary and secondary streets have been plowed.

Sixty-horsepower track-type tractors with combination road machine and motor patrol graders are used on paved streets. All rutting and dangerous conditions are eliminated as a result of getting the street down to its pavement surface.

The city plows all its sidewalks. A 6-ft. iron V-plow pulled by a team of horses is used for this work. A route is assigned to each teamster which he can cover in approximately 6 hours. We have the city divided into 160 of these routes. These teams are hired and not owned by the city. Small tractors have also been used for this class of work but we have found that the use of horses has given us better service at a much cheaper cost.

The city maintains plow service in alleys where traffic conditions are such as to justify the expenditure. For this work either a truck or a 30-hp. crawler-type tractor with a V-plow is used.

The department keeps in close touch with weather reports and, as storm conditions regulate the time of starting snow-plow operations, the night watchmen are instructed to call street supervisors in case of sudden storms. Unless it is an abnormal snowfall we wait until the storm has abated.

Snow Removal.—Each place in the city where snow is to be removed has been marked on a survey map, various areas being assigned to either the mechanical loaders or hand crews in their numerical order as to their importance to the entire city.

Mechanical Loading.—This organization consists of a general foreman in charge of our three mechanical snow loading crews; under him is a foreman in charge of each crew and assigned to each crew, as shown in Fig. 2, are the following:

1 mechanical snow loader
8 5 to 7-yd. trucks
160-hp. crawler-type tractor (with combination road machine)
1 10-hp. crawler-type tractor (with one-way plow)

The functioning of these crews is as follows: After the snow-plowing organization has cleared the entire pavement and the street has been cleared of all parked cars, the task of snow removal starts. The sidewalks are cleared and the 10-hp. tractor equipped with a special one-way plow is put to work pushing all the snow off the sidewalks into the street. When this has been completed the 60-hp. tractor equipped with a one-way plow or with an attached blade machine starts operation at the curb, windrowing the snow about 5 ft. away. The

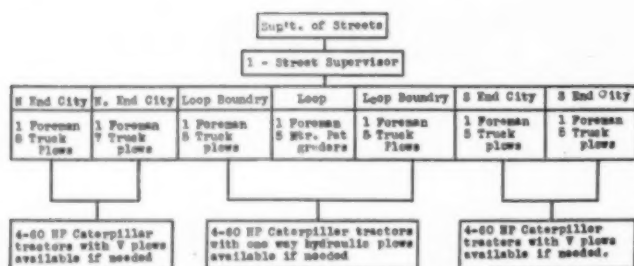


Fig. 1.—Division of City into Snow-Plowing Divisions

tractors preparing this work are far enough ahead so as not to slacken up the speed of the loader. The loader is then put into operation, each machine being able to load on an average of 200 yd. per hour. These machines work night and day until snow removal is completed. All the snow from these machines is dumped into the sewer through specially constructed manholes.

Hand Loading.—These crews center their activities on car stops, street intersections and fire hydrants and in front of business houses, schools and churches, outside of the loop district. The supervision of these crews is under the direction of a district street supervisor, who has his orders as to locations to be given snow-removal service and the numerical order in which this service is to be performed. These crews usually consist of a foreman, from 8 to 12 shovelers and either trucks or teams depending upon the length of haul. Most of this snow is dumped into sewer manholes, a small part of it being hauled to low land dumps.

Parking and Traffic Conditions.—The increasing parking problem and traffic conditions work a hardship on the snow-plowing and snow-removal organizations and add in a large degree to the final cost of their work. In our loop district we have a 60-minute parking ordinance between the hours of 8 a. m. and 6 p. m. Between the hours of 6 p. m. and 8 a. m. the following morning we have no parking regulation other than a 6-hour ordinance which applies to the entire city. The department takes advantage of this 6-hour parking ordinance. We have a number of men who are given police authority and assigned certain sections of the city. Their duty is to tag all cars violating the 6-hour ordinance. This procedure has been a big help to us in getting at the car owner who continually uses the street for a garage.

Costs.—Much has been said as to cost accounting on snow plowing and removal. Some have advanced the cost per mile on snow plowing as a unit. This in my opinion as applied to city work is of no value and I fail to see how it can be of any benefit in arriving at unit-cost comparisons unless street classifications, climatic conditions, snowfall and equipment used are taken

into consideration. This sort of report would be impractical and valueless for budget purposes. Attempting to figure snowfalls is like guessing the days that it will rain. Our machine costs are based on the following rental rates:

Mechanical loader	\$7.00 per hour
60-hp. tractor with V-plow	6.00 per hour
60-hp. tractor with one-way plow	6.00 per hour
60-hp. tractor with blade machine	6.00 per hour
30-hp. tractor with one-way plow	2.25 per hour
5-ton truck with plow and two men	5.00 per hour
Motor patrol grader	5.50 per hour
30-hp. tractor with V-plow	5.00 per hour
Team	\$ 5.50 per 8-hr. day
Sidewalk plow routes	10.00 per 8-hr. day
	\$11.25 contract price for each time plowed

Our snow-removal budget for 1931 for winter maintenance, which includes snow plowing, snow removal, sanding, catch-basin thawing and general street maintenance and cleaning (with the exception of paving repairs), amounts to \$204,000, or \$51,000 per month for the winter season; while the general street maintenance and cleaning expenditures (with the exception of paving repairs) for the balance of the year amount to \$712,000 or an average of \$89,000 per month.

The 1920 winter street maintenance amounted to \$197,000. If we were justified in spending \$49,250 per month for winter service in 1920, we are fully justified in spending \$51,000 for winter service in 1931.

Acknowledgment.—The foregoing paper was presented at the 11th annual conference of the International Association of Public Works Officials at Louisville, Ky.

Snow Removal in Pennsylvania

The 1930-31 snow removal program of the Pennsylvania Department of Highways has been increased by 1,200 miles over last year and nearly 10,000 miles of highway will be maintained clear of snow and treated for slippery conditions.

This year the department will mobilize 729 pieces of motor equipment for plowing. The list of equipment includes 603 trucks equipped with the blade type of plow, 55 with "V" plows and 11 with rotary units. In addition 78 tractors are fitted out with plows—18 of the rotary type and 60 "V" plows.

In the office of the equipment engineer, who directs the snow-fighting forces, is a large-scale map of Pennsylvania, reproducing the entire highway system, counties, districts and sections are designated. Tiny triangular flags and vari-colored beaded pins mark weather and conditions along each section, telling the chief at a glance what his army faces.

Each morning of the snow season reports are received from maintenance districts in the field on a printed post card form. The report describes the weather that day, temperatures, actual road conditions as to snow and ice formation. A forecast for the next 24 hours is included.

The map is marked to reflect each day's reports. Changes are made as wired messages tell of new conditions.

Plows are spotted in 120 equipment storage sheds located at various "key" points throughout the state. In sections where annual snowfall is heavy more plows are distributed, including those of heavier type.

At each storage shed a watchman on duty makes periodic inspections of the weather. At the first sign of snowfall the truck crews are warned to be available for duty. When snow reaches a depth of 1 in. they are called out. At 2 in. the plows go out and take up the patrol, staying out until the snowfall is ended and all roads are clear.

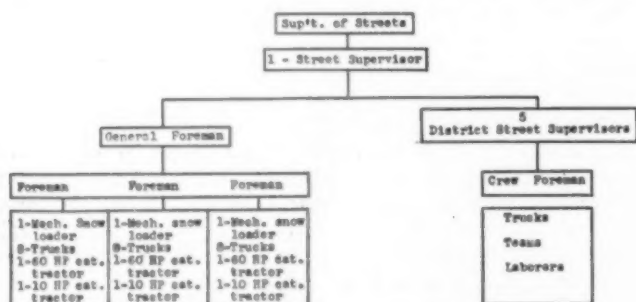


Fig. 2.—Organization of Mechanical Snow-Loading Crews

British Experiments with Rubber Paving

VARIOUS experiments with rubber paving have been made in Great Britain since 1913, and as a result trial lengths of the most successful examples have been laid in public streets and are now in use. Some interesting information on four test sections was given at the recent 6th International Road Congress at Washington, D. C., by the group of British engineers reporting on "Construction and Maintenance." That portion of the report relating to rubber paving was prepared by Ambrose W. Cross, Chartered Civil Engineer, Midland Brick Association; E. A. Evans, F. S. I., Assoc. M. Inst. C. E. County Engineer, Denbigh; S. McPherson, General Secretary, the Institute of Quarrying; R. S. Murt, Assoc. M. Inst. C. E., Chartered Civil Engineer, County Surveyor, Stafford; James Lang, C. E., Surveyor to the Kilmarnock District Committee, Ayrshire County Council; Lieut. Col. T. H. Chapman, O. B. E., Rubber Growers' Association.

The following is quoted from this report:

The four examples considered in the report are as follows:

- (a) North British Block, in Shadwick Place, Edinburgh (1923), Buchanan Street, Glasgow (1923 and 1929).
- (b) Gaisman Block, in New Bridge Street, London (1926), and Market Street, Newcastle (1929).
- (c) Cowper Block, in Thurloe Place, London (1928).
- (d) Cresson Block, in Croydon Road, Anerley, London (1928 and 1929).

Particulars of the above blocks, methods of laying, cost, condition, and results, and remarks thereon, follow.

North British Block.—Block, 9 by $4\frac{1}{2}$ by $1\frac{1}{2}$ in. rubber cap, mounted on a concrete base of slightly smaller size and $2\frac{1}{2}$ in. deep. The cap has a wearing top of $\frac{3}{4}$ in. resilient rubber which is vulcanized to a tread of hard-rubber compound of about the same thickness. A chaplet of steel with two extending legs or arms is embedded in the tread, the legs serving as an anchorage and connection to the concrete half of the block which is cast around them. The wearing surface is made slightly higher in the middle which prevents wear on the edges and gives good holding to traffic.

Makers.—The North British Rubber Co. (Ltd.), Edinburgh.

Foundation, bedding, etc.—Laid on existing concrete foundation; bedded on 1 inch of 3 to 1 sand and cement, slightly damped; gently rammed to correct levels. Joints grouted in with hot pitch.

Cost.—£4 10s. a square yard laid without foundation.

Condition and results, etc.—Traffic in Glasgow is some of the heaviest and most trying class, mixed and moderately fast. The cap of one block came away from its tread in 1925, this is the only defect reported. The paving is in good condition and shows no apparent wear after six years' use. The area, a crossing of 40 by 10 ft., has just been increased by 1,000 sq. yd.

In Edinburgh, in an area of 220 sq. yd., defects have been reported in the case of six blocks; these were replaced. No other repairs have been required. The paving is in excellent condition and shows no signs of wear.

Remarks.—This paving has no tendency to polish or to become slippery. No accidents or complaints have been made in regard to skidding. No sign of corrugation or waviness is apparent. The surveyor reports in regard to Edinburgh that it is quite evident that this is the most silent form of paving in the city.

Gaisman Block.—Block, $10\frac{3}{8}$ by $8\frac{3}{8}$ by $4\frac{1}{2}$ in. deep. A resilient rubber cap $\frac{5}{8}$ in. (approximate) thick is vulcanized onto and into the recesses of a vitrified brick base. The wearing surface is flat with shallow grooves in it about 2 in. apart.

Makers.—Universal Rubber Paviers (Ltd.), Audenshaw, Manchester.

Foundation, bedding, etc.—Laid on existing foundation of concrete (12 in.). Bedded on $\frac{3}{4}$ in. clean sand lightly rolled; the blocks being dipped as to bottom, one side and end in hot "Rubgrip" (bituminous) and set close, and tapped into place if necessary. The joints were then grouted with the same hot mixture.

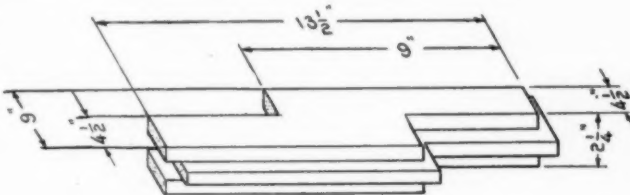


Fig. 1—Cowper Block

Cost.—£4 10s. per square yard laid without foundation.

Conditions and results, etc.—Traffic in New Bridge St. is among the heaviest in London; the census gives 17,623 vehicles or 51,100 tons from 8 a. m. to 8 p. m. and there is considerable night traffic. After two years of wear, 416 blocks or say 4 per cent were renewed, and now at the end of the third year, approximately another 10 per cent have to be renewed. The defects are in the nature of blisters and the subsequent peeling off of thin layers of the cap where blisters appeared. The layers stripped off in no case extend to the full surface of a block and are about $\frac{1}{5}$ in. thick; the defects cause no inconvenience to traffic, but they collect dirt and are a blemish. The rubber surface of the blocks in general shows but little wear, and the defects that have occurred appear to be due to the caps being formed in layers instead of cut out of solid rubber sheeting of the required thickness. The area in New Bridge Street is 700 sq. yd., and in Newcastle 1,000 sq. yd.

Remarks.—No accidents due to skidding have been reported, but it is stated that when the surface is wet and slimy there is a tendency for vehicles to skid forward if brakes are quickly applied. On the other hand side slipping and swinging have not been experienced. Sand has been used in wet weather but it appears to increase the slime after a short time and to make matters worse. In spite of the heavy traffic in New Bridge Street there has been no movement or creep in the blocks or rubber caps and there is no sign of water getting underneath. There has been little reduction observable in the thickness of the rubber surface, the levels appear to have remained intact, adjacent wood paving laid at the same time has been worn down by about one-half inch.

Cowper Block.—Slab, dual, 9 by $4\frac{1}{2}$ by $2\frac{1}{4}$ in., interlocking. (See Fig. 1.)

It is composed of three different classes or compounds of rubber of equal depth, the middle layer being of a hard composition, and the others of softer and tougher material. Blocks and slabs of half size are used to bring margins to a straight line. The interlocking is very complete; the slabs are tongued and recessed on all

sides and ends, the holding being equal to about half the surface area. The top is roughened with fine ribbing to prevent slipping.

Patentee.—J. Sheridan Cowper, 24 Queensberry Place, London S. W. 7.

Foundation, bedding, etc.—Concrete foundation, 6; 1 gage, 8 in. thick with 3:1 floating, 2 in. thick, no reinforcement or expansion joints.

The slabs were laid direct on the concrete and tapped into place; joints were painted with spray emulsion. The jointing is tight and the spread of the upper layer of rubber under traffic pressure makes the seal tighter.

Cost.—£4 16s. per square yard, exclusive of laying and foundation. The patentee states he can produce the block and lay it, about £2 per square yard, on mass production.

Condition and results, etc.—Area laid, 300 square yards. Traffic in Thurloe Place is not heavy, but the roadway is only 24 ft. 4 in. wide and the wear is thereby concentrated. There is a big motor bus traffic on the road, some 1,700 buses a day traveling at fair speed, and they apply their brakes on the rubber and turn off into another street.

The rubber paving has spread slightly and turned up a trifle against the curb but the slabs have retained their position and have not moved or crept. The paving has been laid for close on two years and no repairs or attention have been given to it.

The finely ribbed roughing of the surface is wearing off, but there is no indication on the plain margins of the slabs that they are being reduced in thickness. There have been no accidents or complaints due to skidding and no waviness is apparent. The condition of the surface is good.

Remarks.—This is an "all-rubber" block and depends for its anchorage on its combined weight and any adhesiveness the lower rubber surface may possess. In previous trials of "all-rubber" blocks there was a tendency to creep, in some instances a considerable movement, due to thermal expansion. This has practically been surmounted in the Cowper block, at any rate up to road widths of 24 feet or thereabouts.

Cresson Block.—Block, 9 by 3 by 3½ in. deep. Consists of a hard composite base made of stone chippings, sand, and other ingredients combined with rubber latex which after compressing and drying is vulcanized together with a resilient cap three-eighths inch thick. The composition base is exceedingly hard, dense and nonporous, and the attachment of the cap is satisfactory. The surface of the rubber cap is flat and smooth.

Makers.—The Netherlands Rubber Co., Singapore.

Foundation, bedding, etc.—Existing concrete foundation laid for wood paving, and blocks after being dipped in hot "Invicta" grout (bituminous) as to bottom, one side and end, were laid direct on the concrete and pressed home against each other. The joints were then run in with the same grouting.

Cost.—£3 10s. per square yard laid without foundation.

Condition and results, etc.—Area laid 200 sq. yd. The condition of the paving is as new, but the blocks have not been down long enough for an opinion to be formed of its wearing qualities. The same make has, however, proved satisfactory in Singapore for a period of seven years under heavy traffic.

No complaints have been made in regard to skidding and there has been no movement or creep of the blocks. The gradient of the road is 1 in 43. Traffic is 8,670 tons daily.

Remarks.—This block, invented by Mr. Cresson, of Singapore, is a scientifically sound production as the

matrix of the whole is rubber. The compressive strength of the composite base is about 558 kilogram per centimeter and the adhesive force of cap to base is 19 kilograms per centimeter width. It would be interesting to see this block under more exacting traffic conditions.

General Remarks.—None of the pavings referred to in this report has been in use long enough, six to seven years at the most, for a comparative "life" to be determined.

The four types of paving dealt with are all patents and the only point they have in common is the essential cap of resilient rubber.

No standard specification for the rubber in the cap exists. It appears, however, that a thickness of from ¾ to ¾ in. is sufficient, provided a hardness of 80-85 (Shore-durometer) is given, the rubber suitably compounded for the purpose, and the cap is cut of a solid sheet.

The reduction of noise and vibration on rubber-surfaced roads is very noticeable, but no definite comparisons with other pavings on a scientific basis have yet been made. A true comparison is difficult to obtain. The Rubber Growers Association is at the moment carrying out investigations that may give more light on this matter.

Reduction in the cost of rubber paving can be procured by (a) using cheaper mixtures in compounding, (b) saving in material, and (c) manufacturing by special plant and not as a side line, but in adopting (a) care will have to be taken that durability is not decreased.

General Conclusion.—So far as they have gone, the experiments with rubber paving may be considered to have given satisfactory results and to have demonstrated the special suitability of rubber for certain situations where durability, reduction of noise, and vibration are material considerations.

Highway Building Is New Extension Course

As a foundation for training in highway engineering, the University of Wisconsin Extension division is offering a new course in Roads and Pavements, given by correspondence-study and intended to be of value for men who plan to specialize in highway work of any type or for those wanting to learn more about the technique of road construction and maintenance.

According to an Extension statement, this course is suited, for example, for county supervisors having responsibility for highway building and maintenance, students contemplating careers in highway engineering, and beginners generally. It is conducted by H. E. Pulver, professor of civil and structural engineering.

The course treats of the scope of highway engineering and the fundamental principles of highway design, construction, maintenance, and management. The technical phases include surveys and plans; the economics of highways; design of rural roads and city streets; the construction, operation and maintenance of various types of roads, such as concrete, tar, macadam, gravel and dirt; and traffic regulation and control.

Special attention is given to the problem of materials of construction and to various other factors in road building which hold possibilities for effecting savings to taxpayers.

This is one of many courses in civil and structural engineering which are meeting individual requirements in gaining technical knowledge through university instruction at home, while the regular occupation goes on.

Heavy Plate Girder in Grade Separation

ERECTION of a 101-ton plate girder 112 ft. 6 in. in length featured the construction of a highway underpass beneath the tracks of the Los Angeles & Salt Lake R. R. at Wineville, Calif., eliminating a grade crossing between the main line of the railroad between Los Angeles and Salt Lake City, and Valley Blvd., a main highway between Los Angeles and Riverside. The bridge is built on a 60-deg. skew and provides a 44-ft. clear roadway.

The structure is of the through-plate-girder type and carries four tracks. The superstructure consists of three main girders, with a double-track floor system on each side of the center girder. The main girders are 12 ft. 7 in. deep, and the distance from base of rail to low steel is 4 ft. 9 in. The center girder weighs 101 tons and each outside girder weighs 67 tons. In the design of the main girders, four 8x8x1 $\frac{1}{8}$ -in. angles were used in each flange, together with four 24-in. cover plates and four side plates, in order to secure the necessary flange area. The web thickness is $\frac{3}{4}$ in. There are approximately 430 tons of steel in the finished bridge. The two abutments contain a total of 3,800 cu. yd. of concrete.

Structural steel was fabricated by the American Bridge Co. at their Gary, Ind., plant and shipped to the site by rail. On account of the extreme height of the girders, special handling was required in transit in order to prevent tipping. Each girder was loaded on three cars, the center car being an idler. Erection was handled by two 60-ton steam derricks, operating on the same track occupied by the cars. In order to eliminate the danger of load swinging, one end of a girder was landed on blocking while the other was being moved. Placing of steel was handled without interference to traffic. Highway traffic was carried over a temporary detour and railroad operation was continu-



Wineville, Calif., Grade Separation Substantially Completed

ous over a temporary structure. Work was commenced on July 8, 1929. The railroad bridge was placed in operation April 28, 1930, and the highway was opened to the public on the following May 9. Finished steelwork was painted with aluminum paint.

Drainage from the depressed portion of the roadway is collected in three catch basins and delivered to a central sump. The sump is equipped with an automatic electrically-operated pump, which discharges into a gravity pipe line leading to a drainage ditch some distance from the project.

Plans for the structure were prepared in the Los Angeles office of the railroad under the direction of L. P. Drew, bridge engineer. Erection was handled by company forces under C. B. Reynolds, construction engineer. The entire project was under the general supervision of R. L. Adamson, chief engineer.



Two Views Showing Placing of 101-Ton Girder, L. A. & S. L. R. R. Grade Separation Project at Wineville

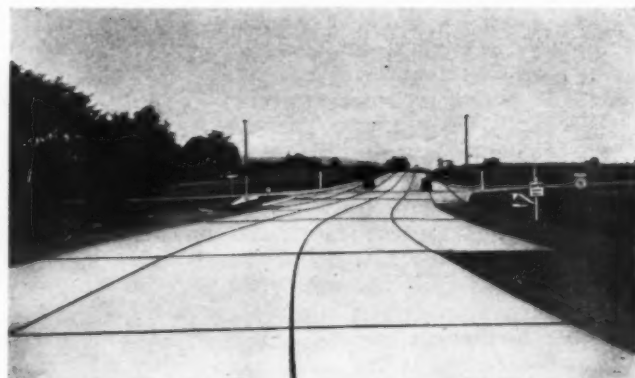


In Bergen County Near New York State Line

New Jersey Roads Built, Planned, for Heavy Traffic

Pictures from J. L. BAUER

State Highway Engineer



Left—Junction of Routes 29 and 31 at Somerville. Right—Looking East on Route 29 at Somerset Road, Plainfield



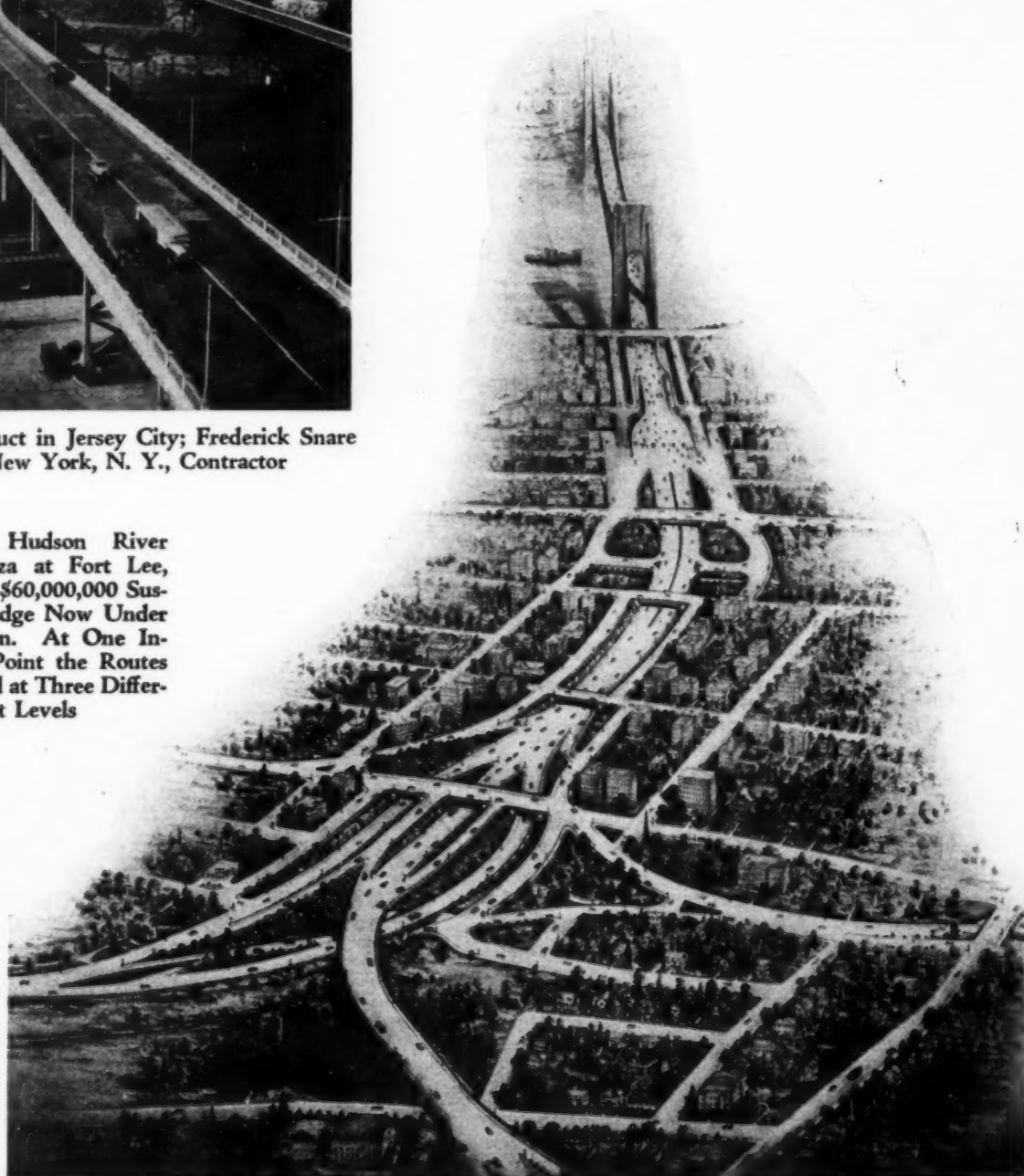
Cloverleaf Intersection Near Woodbridge, Providing Free Traffic Flow at Intersection of Routes 4 and 25, Two Heavily Traveled Highways; Rudolph & Delano, Tamaqua, Pa., Contractors

Right—So-Called "Diagonal Route" High-Level Viaduct From Newark to Jersey City Across Kearny Peninsula, Crossing Hackensack and Passaic Rivers at 135 Ft. Clearance Above High Water. The 3-Mile Section Now Being Built Will Cost About \$21,000,000. Contractors: Foundation Co., Arthur McMullen Corp., Tunnel Construction Co. and McClintic-Marshall Co., All of New York, N. Y.



Highway Viaduct in Jersey City; Frederick Snare Corp., New York, N. Y., Contractor

View of Hudson River Bridge Plaza at Fort Lee, Leading to \$60,000,000 Suspension Bridge Now Under Construction. At One Intersection Point the Routes Are Carried at Three Different Levels



EDITORIALS

The Prospective Doubling of Highway Expenditures in Ten Years

DURING the third quarter of 1930 the gasoline tax in California yielded 6.8 per cent more than during the same quarter in 1929. At 3 ct. a gallon \$10,608,817 were collected in this last quarter, at which rate \$42,400,000 will be available for state road construction and maintenance during the coming year, exclusive of motor-car license fees and federal aid funds.

It is evident that the business depression has not reduced gasoline sales in California; and if the rest of the country shows the same rate of increase, nearly 7 per cent more money will be available annually for highway work from now on. With the cessation of "hard times" this rate of annual increase will probably become greater.

In California there are 378 motor cars per 1,000 of population. If the rest of the United States had as high a rate of car registration there would be more than 46,000,000 cars in use now. That alone will mean about 80 per cent increase in the number of motor cars when the rest of America overtakes California; but while the less wealthy states are catching up with California, that state will be forging ahead in the number of cars per 1,000 people and will be closely followed in that increase by states whose per capita wealth is about equal to that of California.

In the June issue of *ROADS AND STREETS* we estimated that there will be twice as many motor cars in America in 1940 as in 1930. This is a conservative estimate, in spite of its startling appearance. Several persons have asked the editor where the money will come from to buy and operate twice as many motor vehicles as are now in use. The answer is that the growth in population will account for about 16 per cent increase in cars in 10 years, and the increase in per capita income will provide for the rest of the 100 per cent increase. For several generations our per capita income has increased 20 to 25 per cent per decade, and during the last decade there has been a somewhat greater increase than the average. Remembering that 40 per cent of our population are engaged in "gainful occupation," and that each of those so engaged earns more than \$1,200 annually, exclusive of any income from savings accounts and investments, it is seen that a 25 per cent increase in income amounts to \$300 a year. There are now nearly 50,000,000 Americans classed by the census as engaged in gainful occupation. Ten years hence there will be 58,000,000. Multiply that by \$300, and you have \$17,400,000,000 increased annual income in 1940.

The total annual income of the American people, inclusive of income from investments, is variously estimated at \$85,000,000,000 to \$100,000,000,000. An increase of 25 per cent in 10 years amounts to more than \$21,000,000,000 annually, based on the smaller estimate of present income. It is very conservative to assume that the American people ten years hence will have 18 billion dollars more to spend annually than they now have. Judging by what they have been doing during the past ten years, a very large part of this increase in income will be spent for motor cars and highways, including the operation and maintenance thereof.

Some of our more optimistic prophets, like Henry Ford, predict an increase several times as great during the next as during the last decade; but we are basing our estimate on what the American people have actually accomplished, and not on what we hope they will accomplish.

Amid the present hue and cry over "hard times," calm voices are heard from such men as Andrew Mellon reminding us that we soon emerge from such periods as this and then forge ahead to greater prosperity than ever. They tell us that the modern "business depression" lasts from 18 to 24 months from its inception until normalcy returns. They point out that these crises are due primarily to overproduction. Too much grain-stuffs here, too much sugar there, too much copper elsewhere, and so on. But they usually fail to tell us exactly how best to avoid such overproduction. For example, they do not tell us that the latent demand for more and better motor cars and highways is still enormous. The human stomach limits the demand for food to about four pounds daily; hence the unserved demand for food in America is nil. On the other hand almost every one-car family wants to become a two-car family, and since we are still a nation of one-car families there is a latent demand for twice the number of cars now in use. Of course this latent demand can become effective only in one of two ways, namely by increasing average wages or by reducing the average price of "goods." During the past year the retail price of foodstuffs in America has declined about 10 per cent, which is equivalent to raising real wages 10 per cent. Were it not that hard times have caused a decrease of 5 per cent in the number of those receiving wages and salaries, there would be available a huge increase in money with which to buy other things than food, such as motor cars. In general, a reduction in the price of any necessity releases money with which to buy other things. Since 1920 there has been a great decline in the cost of living, while average money wages have remained almost unchanged. The result has been the annual release of enormous sums of money with which motor cars, radio sets and a thousand and one other things have been bought.

Research, invention and business acumen operating under the spur of competition have brought about most of the decline in American commodity prices since 1920. These economic forces will probably continue their operation on a greater scale during the next decade. Our greatest economic problem is so to direct these forces that the most rapid industrial expansion will occur in those fields where latent demand for "goods" is greatest. In America the highway industries—including motor vehicles—must be classed as among those where the latent demand is greatest. Consequently those of us who are interested in highway industries will perform an important economic service if we continue our efforts to expand these industries at an even faster rate than during the past decade. We should set as a goal—one easily capable of realization—the doubling of the present annual expenditures for road and street work within ten years.

Gold Hoarding As a Cause of Lower Prices and Wages

SIR HENRY STRAKOSCH attributes the world wide decline in commodity prices to the hoarding of gold by America, France and Argentina, particularly America. The money of the leading nations of the world is on a gold basis, but the gold is so inequitably distributed that a shrinkage in per capita money has occurred in most countries, with a resulting decline in commodity prices and wages in those countries. American prices have had to follow the world wide trend, at least as to all products that are sold by us in large quantities abroad. This, in brief, is the Strakosch theory, and it seems to be sound.

It is noteworthy that even in this country of vast gold holdings, our per capita currency in circulation has declined from \$50.44 as of July 1, 1920, to \$37.31 as of June 30, 1930. The financial depression of 1920-21 caused our per capita money to shrink 20 per cent in two years, but under the control of the Federal Reserve it has never rebounded much from the low level of \$39.86 at the middle of 1922. At the middle of each of the last six years it has been:

1925	\$41.51
1926	41.85
1927	40.53
1928	40.52
1929	39.62
1930	37.31

Even before the recent business depression began, there was a 5 per cent decline in our per capita currency during the two year interval between 1927 and 1929, and another 5 per cent decline occurred in the following year.

In Gillette's Handbook of Construction Cost it is shown that for more than a century money wages in America have followed the trend of per capita money. It is also shown there that wholesale commodity prices have, on the average, followed the quotient of average money wages divided by the average per capita production of "goods." These wage and price laws that were deduced by the editor in 1920 have as good a basis of fact as any quantitative general economic laws. It will be seen that the explanation that Strakosch gives of declining prices and money wages is in accord with these laws.

The *Economist* has shown that since 1914 gold in the banks and central treasures of the world has increased nearly 5 per cent annually. Since population has increased less than 1.5 per cent annually, the increase in gold has been adequate to care both for increasing population and for an increasing per capita output of goods amounting to nearly 3.5 per cent annually. Even in America the increase in productivity per capita has been considerably less than 3.5 per cent, hence there has been no lack of gold production.

The charge of gold hoarding is apparently well founded. Since there is no likelihood of much change in the American policy of hoarding gold, and since the payments of interest on foreign debts to us are likely to continue on a great scale, we probably face the very unusual spectacle of declining prices and money wages, in spite of the fact that our banks are bulging with gold.

As to money wages remaining unaffected in the face of declining commodity prices, that can and will occur, provided that our per capita money does not decline. But our per capita money has declined 12 per cent in 7 years, and this sort of a change will not persist much

longer without a corresponding reduction in wages and salaries. In fact, although newspapers have little or nothing to say about wage reductions, there have been many noteworthy cuts in money wages during the past year. These, it is true, have been forced upon employers by the declines in their business; but before the general business decline, and at least partly responsible for it, there was a decline in per capita money in circulation.

Since about 40 per cent of our population is gainfully employed in normal times, and since this percentage has varied but little in 70 years it is evident that unless per capita money remains constant, money wages can not remain constant. Let our total money in circulation remain constant while our population is increasing 1.6 per cent annually, and inside of 10 yrs. we have 16 per cent more workers but only the same amount of money with which to meet the larger payrolls. The inevitable result must be either a reduction in wages or a speeding up of the velocity of money circulation.

We are aware that there are many economists who believe that bank checking accounts are the exact equivalent of money, but our analysis of commodity prices and wages extending over a century has shown the falseness of that theory. Our credit structure whether it be bank credits or any other credits, rests upon gold. If we could entirely divorce our business from that of the rest of the world, and free our gold from artificial restraint of flow into business channels, declining money wages would not be occurring. But neither of these conditions seems likely to exist very soon.

We are therefore likely to see reductions in money wages. This, however, does not mean reductions in "real wages," namely wages measured in what wages will buy. As a matter of fact "real wages" have risen about 10 per cent in many parts of America during the past year, because the cost of living has declined 10 per cent. At the very time that many employers were suffering great losses their employees were enjoying great gains,—provided they held their jobs at full-time pay.

There has been a lot of talk about the danger of reducing money wages because of its effect on the buying power of employees. But we fail to see any distinction between reducing wages 10 per cent and reducing the number of employees 10 per cent. One or the other will inevitably occur unless our per capita currency soon regains its recent loss; for employers can not make 90 ct. serve the place of \$1 in their payrolls.

H. P. Gillette

A Yard Stick for Stage Construction

IN progressive or stage construction of low cost highways the question arises as to when the existing type of surfacing shall be improved to one of a higher type; that is, what yard stick shall be used to measure the necessity for improvement of the existing surface.

Traffic capacity is naturally the first thought for engineers know by experience rather than by theory that between fairly wide limits, a gravel road will carry up to 500 vehicles per day and that a bituminous treated gravel will carry from 1,000 to 2,000 vehicles. But these limits are too wide and a more accurate measurement must be made.

Authorities who have long studied road surfaces and their traffic capacities agree that a truer method is one

which states the condition of the existing surface in terms of the regularity of its riding qualities together with a determination of the cost of maintaining the surface in that condition and the carrying charges on the investment.

By this method the regularity of contour could be measured with a roughometer or similar device and the costs of maintenance and financing would be matters of cost accounting and bookkeeping.

Then by utilizing traffic counts the unit of measurement would become the cost per vehicle mile for owning and maintaining a given type of surfacing, so that it would have not more than a definite number of irregularities in each mile of road surface.

Such a method could automatically require a smooth riding surface and this in turn would insure a low cost of vehicle operation; and since tests show that vehicle operation costs exceed the costs of surface maintenance a double economy would be effected.

When the cost of maintenance becomes equal to or exceeds the carrying charges serious consideration must then be given to a change in type whose maintenance cost will be less than its carrying charges.

Evaluating Low Cost Roads

THERE is a real need for evaluating the serviceability of every type of road surfacing and it is refreshing and instructive to find such definite statements as those made by W. C. Davidson, State Highway Engineer of New Mexico, and his Construction Engineer, E. B. Bail, on the Economy of Oiled Roads in New Mexico.

Based on three years of construction and maintenance experience, traffic counts and cost data on this type, their statements are authoritative—

"Investigation of a large number of projects, constructed of such types as gravel, crushed stone, caliche and selected material, shows that the loss of original surfacing is 1 in. in thickness per year.

"The projects under consideration will average a width of 16 ft., which will mean a loss of 260 cubic yards per mile of surfacing annually. At an average cost of \$2 per cubic yard, the loss per mile of the original investment is \$520 per year. Add to this the maintenance cost of \$230, and we have a total annual cost of \$750 per mile.

"Against this figure of \$750, we have, in the case of the oiled road, a maintenance charge of \$200 plus interest (6 per cent on \$4,000) of \$240, or a total of \$440. The net annual saving is, therefore, \$310 per mile, which would be sufficient to pay off the extra investment of \$4,000 in a period of 13 years.

"But this is not all. The roads which have been oiled are carrying an average daily traffic of 300 vehicles the year around. Therefore, each mile of road takes care of 109,500 vehicles annually. The difference in motor vehicle operation costs, as between an oil-surfaced road and a gravel-surfaced road, is from 1 to 2 ct. per mile. We will take the lower figure, to be conservative. The saving to the motorists is, then, \$1,095 for every mile of road so constructed.

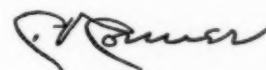
"In addition to the foregoing analysis which portrays the business angle, there are many other benefits. The road is safer because the dust hazard has been eliminated. The added pleasure of driving is a vital consideration as every motorist knows. Finally, by offering the public a better utility, you have created an incentive for increased travel with its attendant returns."

Conventions and Committees

THE season for highway conventions has arrived and with it a multiplicity of papers and reports. Many men have spent many hours collecting, tabulating and correlating data which will be presented to these conventions in the form of reports. States, counties, cities, contractors, educators and manufacturers have been questioned and requested for information, until perhaps their patience is exhausted and they with others ask—Why committee reports?

The answer is that existing knowledge which should be utilized may be quickly put into the hands of the man on the job so that he can be assured that he is doing his work with a full understanding of the known facts which bear upon his problems.

If these reports are clear and concise statements, and if they leave the field clearer than before, then resources will be more economically utilized and real progress recorded.



One Way to Help Solve Unemployment

JOHN SHERMAN, noted financier of the reconstruction period that followed the Civil War, listened for weeks and months and years to the various proposals of would-be statesmen as to how the United States Government could resume specie payment and end the demoralization of business that was caused by the constant fluctuations of the paper currency or "greenbacks" which formed about all of the circulating medium that would circulate under the existing conditions of uncertainty.

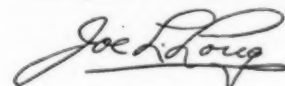
Finally John Sherman rose in the Senate and said, "Gentlemen, the way to resume specie payment is to resume."

So they did it and that question hasn't come up since. The way to solve unemployment is to give employment. We are entering winter when employment is a vital necessity to many hundreds of thousands of willing mechanics and workmen.

We appeal particularly and directly to all State, County, City and other municipal governmental bodies to place your orders for material and equipment as soon and as rapidly as possible. Accept delivery if you can, but if not, specify as early delivery as practicable, so that manufacturers can go ahead and make those things you will need in the spring.

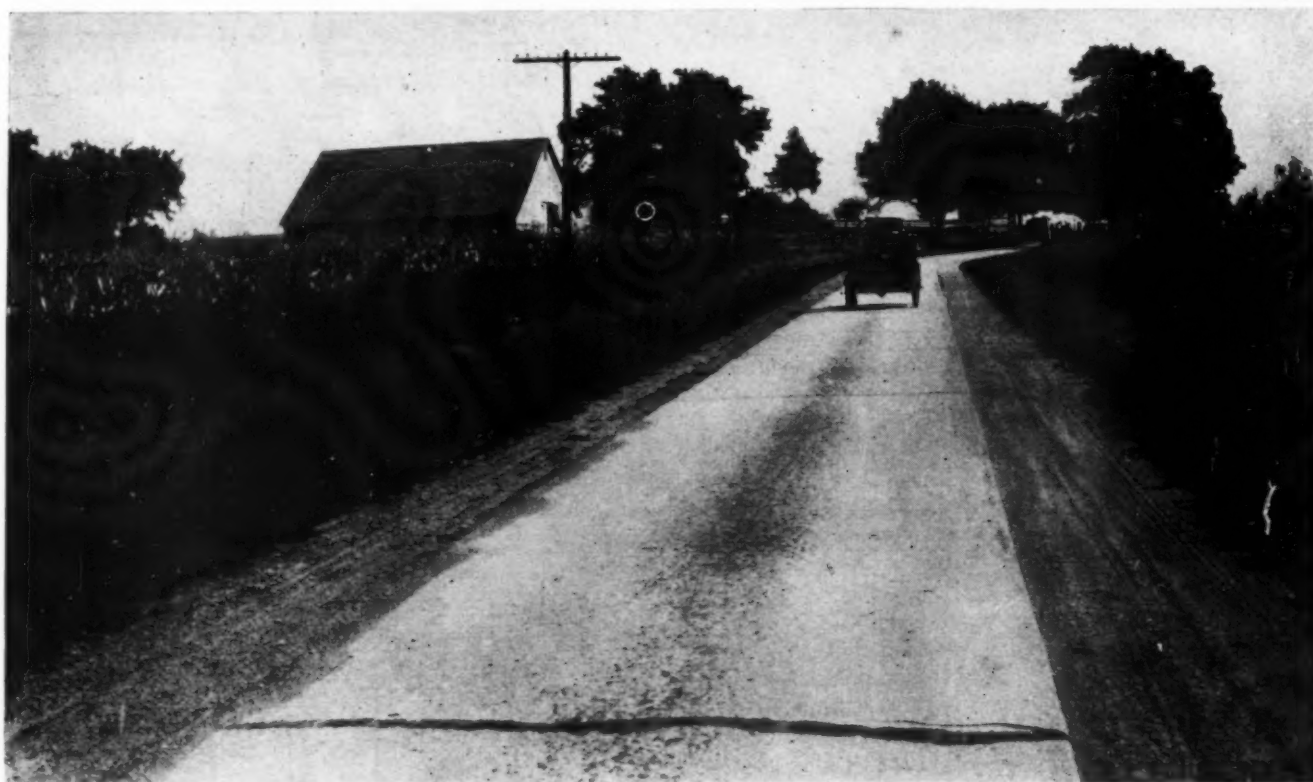
If one-half of the equipment that is going to be bought for spring delivery was ordered before the holidays, it would mean employment for hundreds of thousands during the winter months instead of over-time work for the trained employees during the rush of April and May deliveries. Don't buy things you do not need but do buy now what you are going to buy anyhow and give winter work to men who must otherwise suffer deprivation for themselves and their families and the loss of self-confidence and self-respect that is inevitable where they are forced to accept charity.

For every thousand dollars of equipment ordered in November or December, you will furnish two men with winter employment. Buy what you can use and Buy Now.



County and Township Roads

A Section Devoted to the Interests of Those Responsible for Secondary Road Improvement



One-Lane Road in Vermilion County

Three Illinois Counties Ride on **ONE-LANE CONCRETE ROADS**

Champaign, Iroquois and Vermilion counties have decided for more miles of one-lane paved surfaces. Farm-to-market roads available 365 days in the year. Widening can be accomplished efficiently when needed. Three counties have 420 miles of one-lane roads

NOW that Illinois counties have been favored in a small measure with a portion of the gas tax returns they are better enabled to construct roads which will serve 365 days in the year. The law under which this gas-tax money is apportioned to the counties grants broad powers to them on the one hand and insists upon specific restrictions on the other. Construction of the lowest to the highest type of road surface is permitted so long as the road is a part of the state-aid system. The strongest controversy arises in connection with type and rotation, and the final decision as to these points may carry with it grave penalties to be paid by those who may use the road in the future or next generation. The dire need for 365-day farm-to-market

roads and the individual ideas and desires of county officials may so influence the county board in its action as to prevent achievement of the objective intended by the framers of the law.

Illinois farmers have had impressed upon them the fact that mud roads cost them heavily. Many economic analyses and studies have been made and carefully checked, showing the cost of mud roads. In Maryland it has been found that travel on earth roads costs 2½ ct. a mile more than on concrete paving. But this is not all of the picture. To this must be added sums which farmers lose through inability to get their products to market when the markets are most favorable. One of the greatest arguments to these gentlemen is

their economic loss on account of poor roads. They are beginning to realize that the construction of more miles of hard road means more prosperous living for them. A part of the information in this article which deals with the construction of one-lane concrete roads in three counties in Illinois appeared in the *Illinois Farmer*.

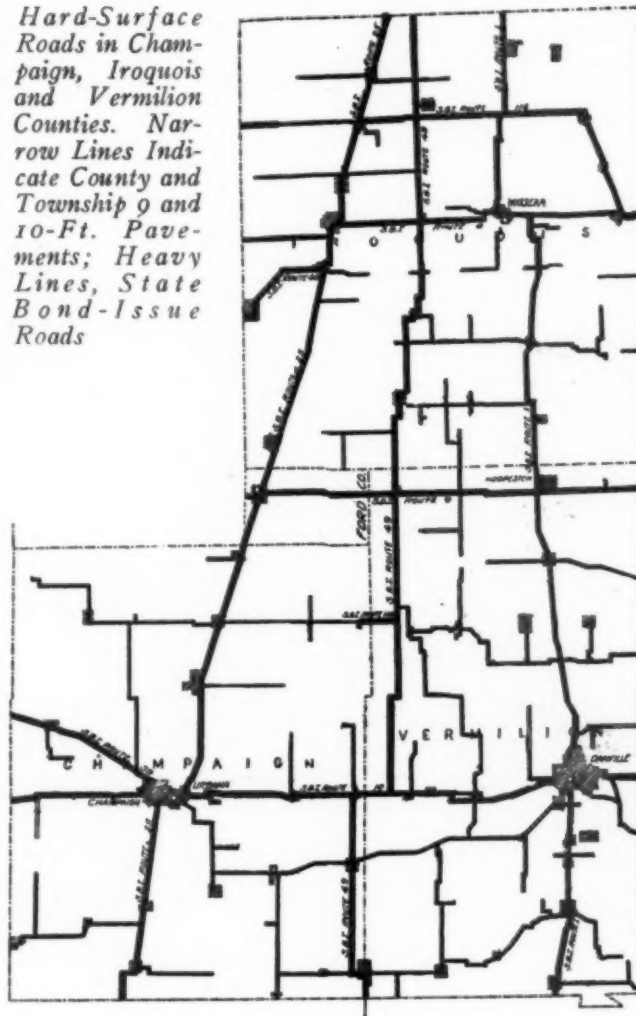
It is both interesting and instructive in connection with this discussion to review the experiences of Vermilion, Iroquois and Champaign counties in Illinois. The accompanying map shows the existing hard-surfaced highways in this area. Narrower lines represent 9 and 10-ft. concrete roads, and the heavier lines the bond-issue routes constructed to date by the state. Integrity of purpose, broad vision and the judicious use of county and township bond issues, county highway funds, special road tax levies and now the motor-fuel tax fund account for this outstanding accomplishment.

Is it better to have 20 miles of narrow paved road or 10 miles of wide slab in our secondary system of farm-to-market all-the-year highways? This question has been answered in favor of more miles of one-lane surface by the highway authorities in these three counties. In the counties named are found 420 miles of 9 and 10-ft. concrete county roads, and this year 40 miles additional are under construction.

Of the 420 miles of completed hard surface roads in these three counties, Champaign has 130 miles; Iroquois, 115 miles, and Vermilion, 175 miles.

The narrow type of hard-surfaced secondary road has been found adequate to carry the traffic it is designed to serve, but these roads are so planned that widening or doubling of driveways can be accomplished efficiently at any time needed. One plan is to build the slab in the middle of the right-of-way, with earth or other good-weather highway on one or both sides. This gives the grade and drainage required for widening by adding a new strip to each side of the primary paving. Other engineers have located the slab to one side, with earth

Hard-Surface Roads in Champaign, Iroquois and Vermilion Counties. Narrow Lines Indicate County and Township 9 and 10-Ft. Pavements; Heavy Lines, State Bond-Issue Roads



road of equal width alongside, giving a double highway, half of which is earth or gravel and half paving.

Maintenance of most of these 9 and 10-ft. concrete roads is paid for by the state. On a majority of them a part of the original cost will be refunded by the state and on other outstanding bonds may be retired by the motor-fuel tax fund.

Vermilion County was the first county in Illinois to attempt county-wide hard-surfaced road construction. For many years W. S. Dillon, county superintendent of highways, has been in charge. In November, 1914, a county bond issue of \$1,500,000 was authorized to construct a county-wide system of 10-ft. concrete roads with a 3-ft. gravel and a 7-ft. earth shoulder on each side. This bond issue provided for the construction of 166 miles, and the program was extended by \$650,000 secured from the state for expenditures on bond-issue routes, 15-D refunds and county highway funds.

Since then many townships have authorized bond issues for carrying on the improvement of the state-aid system.

Very recently a movement was initiated for the presentation to the voters of another \$1,500,000 bond issue which, it is expected, will complete the entire county-state-aid road system. This additional construction amounts to 80 miles of 10-ft. concrete road, and the principal and interest will be retired from the county's share of motor-fuel tax receipts.

In Iroquois County a somewhat different plan was followed. In 1919 the county board laid out a system to be improved with county highway funds. It was



Single-Track Concrete Pavement in Vermilion County

agreed that if any township should improve a state-aid road within its boundaries with a permanent type of construction and build under the provisions of section 15-D of the state-aid road and bridge act, the county would construct an equal mileage in that township of the same type and under the same provisions as soon as funds became available.

The plan was so successful that 18 out of 26 townships have approved bonds to the total amount of \$1,368,000, and have also provided additional moneys through special road-tax levies. Some townships have voted two or three issues, and the time is not far distant when this county will have a complete system of farm-to-market 10-ft. concrete roads.



One-Lane Pavement Through Farm Community in Iroquois County

In Champaign County there was agitation for a bond issue as far back as 1916, but it was in 1923 that voters approved a bond issue of \$2,500,000 by a vote of two to one. This issue called for the construction of 173 miles of 9-ft. concrete road. Actually only 130 miles were built and the difference in mileage is accounted for by the unexpected amount of bridge construction and rising costs. Since the exhaustion of the bond-issue fund, however, the county has constructed 6 additional miles, and has contracted for another 6 miles of 9-ft. concrete pavement, using whatever funds might be



Dixie Highway in Iroquois County

available. State refunds approximate \$1,250,000, which, with motor-fuel tax funds, will provide ample money for the completion of the original county bond-issue system together with a large extra mileage.

Practically all of this construction program has been under the direction of Forrest Fisher, superintendent of highways at Urbana.

These counties thus find themselves in an enviable position. The 10-ft. concrete farm-to-market roads have paid for themselves in lower costs of transportation. No one can estimate the return to the farmer who has been able, because of their construction, to take advantage of favorable markets.

The motor-fuel tax law provides that other than hard-surfaced roads built under its provision must be maintained by the county. While gravel roads have their legitimate place in any county system there is grave danger in many cases that through the desire for mileage an unbearable burden of maintenance costs may be wished upon the next generation.

Illinois counties might well resort to this policy by first laying out an intelligent system which should connect every town and village, and then build permanently by bond issue or otherwise in the order of importance of the location of the road and the anticipated traffic which it will be called upon to carry.



Ten-Foot Pavement in Iroquois County



Completed Surface after Application of Special Macadam Binder and Pebbles and Rolling

Special Features of County MIXED-IN-PLACE ROAD

By LEO WYKKEL

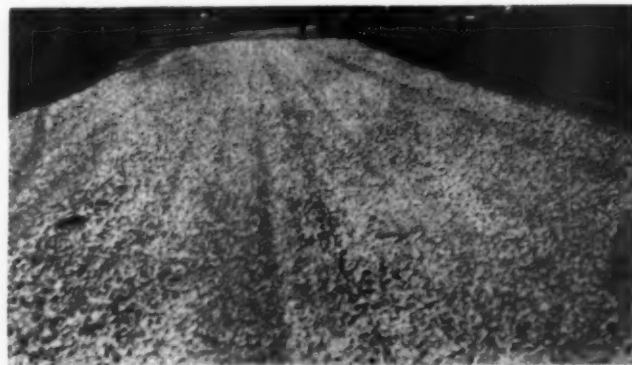
County Engineer, Kalamazoo County, Mich.

AN interesting experiment and one which has resulted in considerable satisfaction is a mile of asphaltic mixed-in-place surface built on a county road in Kalamazoo County, Mich., during the past year. Specifications of the materials used and the details of the methods of construction have been of considerable interest to engineers and road commissioners throughout the state, and the results obtained have given such complete satisfaction that the experiment warrants a brief discussion.

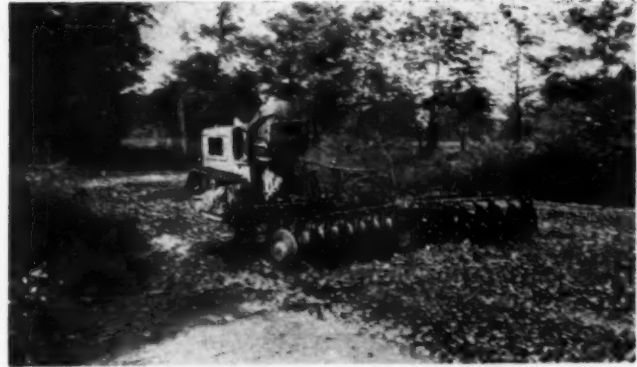
This road originally was a 12-ft. gravel road and was maintained for two years in the usual manner with motor patrol grader and oiled once each year for a dust palliative. On this surface was a loose mulch of approximately 1 or 1½ in. of fine pebbles which was carefully smoothed to an even thickness over the entire width of the road, and on which was placed loose gravel ranging in size from ⅛ in. up to 1½ in., the entire amount at least 60 per cent crushed. This material

was spread evenly over a 20-ft. width and to a depth of 2½ in. A heavy liquid asphalt was then applied by power distributor at the rate of ½ gal. per sq. yd. The asphalt and gravel were then thoroughly mixed and as soon as the pebbles were thoroughly coated with the asphalt, another application of ½ gal. per sq. yd. was made. After further mixing, the surface was rolled with a 10-ton, three-wheeled roller. About three or four weeks later, the mixed-in-place surface was covered with a squeegee coat of Texaco special macadam binder, approximately 0.4 gal. per sq. yd. being used, over which fine pebbles were spread and rolled.

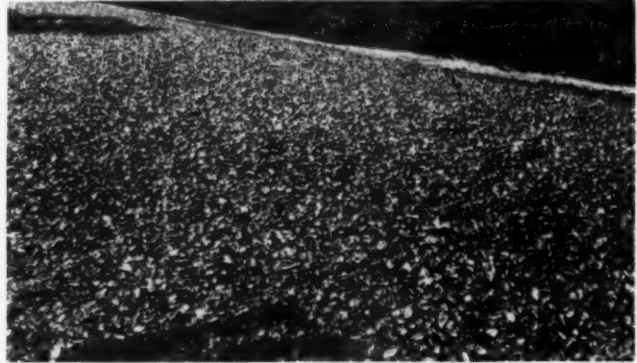
Although this same type of work with different modifications and variations is being done in various parts of the country and is known by such names as mulched treatment or mixed-in-place treatment, the special features which marked the work done by this county last summer and which differ from the other methods used are as follows:



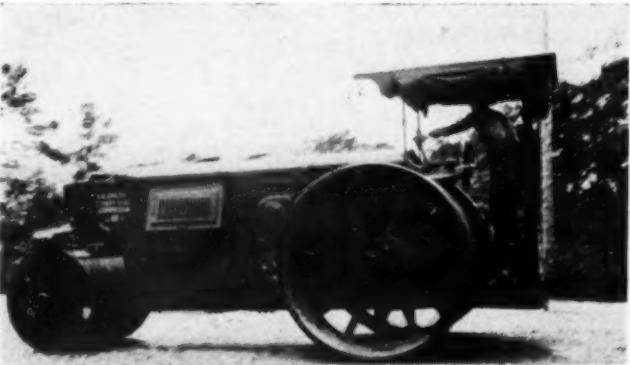
Left—Loose Material Spread Evenly Over Width of Road. Right—60 per Cent Crushed Material Spread on to Depth of 2½ In.; Road Now Ready for First Application



Left—Surfacing Material Applied Over 20-Ft. Width. Right—Double Disk Harrow Mixing Asphalt and Aggregates



Left—First Application After Thorough Mixing. Right—Surface After Second Application and Thorough Mixing



Left—Rolling With 10-Ton, Three-Wheeled Gas Roller. Right—Surface After Two Hours of Rolling

First, a local gravel was used instead of shipped-in crushed limestone, so widely used throughout this state. Second, a heavy liquid asphalt, Texaco No. 65 surfacing material, was used, rather than tar or a light asphaltic road oil.

Third, and probably the most important, was the method of mixing. Instead of blading the material back and forth with a grader, the mixing of the aggregate and the bitumen was accomplished much more economically and thoroughly by the use of a double disk harrow and a spike-tooth drag hooked up tandem and drawn behind a light crawler-type tractor. This method of mixing not only resulted in a better mixture but left the final surface in a much smoother and even thickness over the entire width of the road. After final rolling the surface resembles in every way the smoothness, riding qualities and general appearance of a bituminous concrete pavement and at an average cost per mile of one-quarter or less that of such a pavement.

New York Proposes Bond Issues for Farm-to-Market Roads

A farm road construction program calling for a bond issue of \$100,000,000 is under consideration in New York State. Commenting on this plan the *Low Bidder*, a publication of a contractors' organization, says:

The proposed \$100,000,000 bond issue to be devoted to a system of farm to market roads in the state of New York is unquestionably a matter which merits careful study on the part of legislators. Considerable sentiment has been created by organizations in different sections of the state in favor of a farm relief program in the form of improvement of approximately 25,000 miles of so-called "mud roads" which serve agricultural areas. It is pointed out that large agricultural sections of the state have not been given the benefit of improved highways through the large annual expenditures for state highways.

BEFORE



In a sandy, rocky soil, this road in the town (township) of Mercy, N. Y., is badly in need of attention



One of the reasons why Point Pleasant Borough and Ocean County, N. J., farmers complained of Dorset Dock Road

AFTER



By simply widening and grading the road with a blade grader, town commissioners of the town (township) of Mercy eliminated the mud holes and narrow places



With borough and township aid Ocean County widened, graded and graveled Dorset Dock Road

A Secondary Road System for Indiana

By WALTON T. HORN

Engineer, Indiana State Board of Tax Commissioners

THE Federal government, recognizing the economic value of developing the arterial highways of the nation, in 1916 passed the Federal-Aid Road Act which gave to the states financial aid in their road-building programs. The direct effect of the act was the formulation of a plan and the adoption of a system of interstate and state highways upon which road construction activities throughout the nation would be concentrated.

Federal Aid.—For several years appropriations authorized for Federal aid have been \$75,000,000 annually and on June 30, 1929, we find 188,857 miles of main interstate and intercounty roads included in the Federal-aid highway system of the nation, of which 79,796 miles have been improved. In Indiana the Federal-aid highway system includes 4,701 miles, of which 1,266 miles have been improved with Federal aid.

The results obtained by the Federal-aid act have been very gratifying. Commendation and praise are due the highway officials both national and state for their remarkable achievements. Through their cooperation and coordination of effort we find ourselves today using a great highway system second to none throughout the world.

In the United States there are over 3,000,000 miles of highways, of which about 10 per cent are included in the state highway systems. Approximately 625,000 miles have been improved with some type of surfacing—63 per cent of the state highway system and 16 per cent of the local roads. About 102,000 miles are hard-surfaced, comprising about 22 per cent of the state highway system and about 8 per cent of the local roads.

In Indiana we have 73,000 miles of highways, of which about 7 per cent are included in the state highway system. Approximately 48,000 miles have been improved with some type of surfacing—99 per cent of the state highway system and 71 per cent of the local roads. About 2,400 miles are hard-surfaced, comprising about 51 per cent of the state highway system and about 3 per cent of the local roads. It is evident that road construction must be a long continued program.

County Highways.—Is it not also evident that state and county governments should at once formulate a plan and adopt a system of intercounty and county highways upon which road construction activities should be concentrated?

Most counties in Indiana since 1913 have accumulated a group of roads which they call a county road system. Practically all county roads in Indiana have been constructed under either the Three-Mile Road or County Unit Act and any road so constructed automatically becomes a part of the county highway system.

Almost universally county officials have acted upon petitions in the order of their filing, priority being determined solely upon date of filing of the petition rather than determining priority upon the more essential factors such as general public benefit, cost of maintenance, density of traffic, etc.

As a result of this practice roads of secondary importance have been constructed ahead of roads of primary importance. Taxing units are bonded to the 2

per cent constitutional limit and have no further funds available for road construction, yet many projects of primary importance are forced to await their turn and in so doing exorbitant maintenance costs are incurred and the traveling public is subjected to unnecessary expense and inconvenience.

Efficient County Planning.—Now let us formulate a secondary highway system in your own individual county. To do this I suggest that you visualize your own county, with which you are entirely familiar, and try to see how closely the following will fit your own particular community.

In most counties in the state you have state roads bisecting the county both north and south and east and west and at the intersection of the two roads is situated the county seat. In each quadrant of the county are various townships in which are located various towns, churches, consolidated high schools and other community centers which both produce and attract traffic. Now let us take each township, which is ordinarily 6 miles square, and bisect it both east and west and north and south, extending the lines over into the next township where they will ordinarily connect with some other community center which will welcome this development. Now we have a criss-cross system in every township and county in the state composed of approximately 12,200 miles, constituting a secondary highway system for Indiana which is firmly interlocked into the present state highway or primary system.

If this plan were adopted we would then have a primary system of 7 per cent and a secondary system of approximately 18 per cent of the total mileage in the state. In a county consisting of 12 townships we would have a secondary road system of approximately 150 miles upon which to concentrate our highway improvements and thereby give to every community an all-weather road. The very communities which we are now connecting have come to depend largely upon motor transport for all their commercial and social activities. If we are to make the most economical and practical use of motor transport we must have roads which are usable at all times on both our primary and secondary highway systems. Motor transport can not be fully effective if limited to trunk-line highways only. Trunk-line highways are of no value unless people can get to them.

State Aid Counties.—Agreeing that present methods are not giving satisfactory results we are confronted with the problem of substituting something in their place which will produce the desired effect. Is not state aid to the counties a solution? A state-aid fund can be created out of the gasoline fund now being returned to the counties, the money to be available to the counties after their boards of county commissioners have established a satisfactory secondary road system in their respective counties upon which the state aid is to be expended. Allocation of the state-aid fund to the various counties would be made upon the same basis as Federal aid is allotted to the various states. Application for, and expenditure of state-aid monies by the counties could be controlled by the same regulatory measures to which the states are subjected when applying for or receiving Federal aid under the Federal-aid act.

Federal aid to the states has proved a highly effective and satisfactory method of developing a primary road system for the nation. Is it not reasonable to assume that by employment of similar methods by the state and counties an effective and satisfactory secondary road system could be given to Indiana?

Building Low-Cost Roads

By J. E. MORELAND

Assistant State Highway Engineer, Nashville, Tenn.

THE phrase, "low-cost roads," has a variety of meanings. To many people it means merely a cheaply constructed road and to others it means any type which is less expensive than rigid pavement. The meaning which seems to be most common defines the term as roads which will satisfactorily carry moderate traffic which can be built at a low enough cost to permit the improvement of a large mileage instead of the building of a few miles of pavement.

The cost will vary according to the available materials and the traffic which the road must bear, but there are a few principles which have a bearing on the selection of a type of surface. Any successful road surface consists of a crust on the surface of the earth which is thick enough to carry the traffic, and which is neither plastic in wet weather nor loose in dry weather. Various means have been resorted to in obtaining this result, from the sand-clay road to the concrete pavement, but all successful surfaces meet these requirements.

The sand-clay mixture is one type in which it is easy to see that the builder is either curing the plastic condition of a clay road or the looseness of a sand road by adding the required material. Traffic-bound macadam and gravel, which have grown in popularity within recent years, generally result in a mixture of the soil with a large part of the stone or gravel, forming a crust which is no longer plastic.

It is often necessary, on account of dust or excessive wear, to place a protective coating, such as surface treatment, or bituminous mixture, over this crust, but the ability to support heavy loads will, to a large extent, depend on how successfully this crust of the earth has been treated. If the conditions mentioned above have been obtained by the use of a small amount of granular material, the addition of a large amount is of doubtful value, except as a wearing surface. Cases have been noted where a well-constructed waterbound macadam surface has failed because such care was taken to see that no part of the material was allowed to mix with the subgrade, and on the same road, under similar conditions, a light coat of traffic-bound macadam has stood the test of winter weather.

The materials which are incorporated in a sand-clay road are generally used more economically than in any other type, because it is so easy to see the reason for their use, but the same principles apply to gravel and stone surfaces.

It is not logical to make a rule that all roads shall have 6 or 8 in. of stone before they are opened to traffic, or before they are surface-treated, because less material may produce the desired results. On the other hand, 12 in. may be insufficient if the soil underneath has not received the help it needs to support the load. The subgrade itself, which is the cheapest available material, can be depended upon to furnish a large percentage of the crust which is to carry the load, and, unless it is incorporated in this crust, the results will generally be unpleasant, except when the rigid types of pavement are used.

In recent magazine articles it is possible to find a description of a method of surface treatment to fit

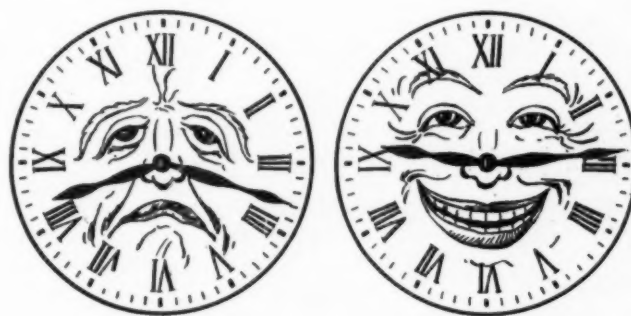
almost any combination of available materials. A study of these various methods will undoubtedly result in a saving of money or increase in mileage, but the writer believes that just as much money can be saved by studying the surface of the earth, and the materials, such as clay and gravel, or stone, which are available for removing its undesirable characteristics.

From 8:18 to 9:14

By JOE LONG

Associate Editor

Every time I pass one of these sad looking dummy clocks that hang in front of jewelry stores and appear in so many places I am reminded of the depressing story, later discredited, that used to be current as to why eighteen minutes after eight was the time shown on all such faces.



It was said that when the maker of these signs heard of Lincoln's assassination he was told that the president was shot at 8:18 and immediately decided to set all his clock faces at this time so that everyone who saw one would be reminded of the great national tragedy. This story fitted in so well with the discouraged, disconsolate and altogether hopeless expression of these dumb clock faces, that it was readily believed until some of these legend-destroyers got busy. During the past year this 8:18 face has become almost a national habit, or maybe we should say "style."

There has been a general air of gloom that has only served to aggravate what no one would deny was a serious situation, brought about principally by excessive optimism of those who thought they had discovered the secret of getting something for nothing and thereby living without working.

It is not our intention to minimize the disappointments and difficulties of the past year for they are history.

What about the coming year?

Now that the elections are over and each of us has gotten out of his system his own particular ideas on how to save the country, let's push our faces up to 9:14.

Only a little matter of fifty-six minutes but it makes the difference between gloom and sunshine and it is not at all unreasonable to hope that it will take but a little change in our mental attitude to make the difference between stagnation and activity, thereby bringing about automatically, the transition from business depression to normal prosperity.

Anyhow it will do each of us a lot of good, individually, if we will quit wearing that 8:18 expression of "all-goneness" and push up to 9:14 even if the skin does crack a little.

The Road Builders' News

The St. Louis Road Show

The most diversified and complete road show and the greatest assemblage of road builders in the history of the nation is promised for the St. Louis convention and road show of the American Road Builders' Association by Charles M. Upham, engineer-director.

"This prediction is based on facts," Upham declares, "for applications for space now on hand will more than fill the available area in the Arena and the two exhibition buildings. After we open the road show offices in Hotel Statler at St. Louis Dec. 1, there will be many more requests for space.

"Also the St. Louis housing committee has handled more hotel reservations to date than compared with a similar date in any recent conventions, and they are receiving hundreds of applications for rooms from day to day. The transportation committee, which is handling travel arrangements to St. Louis, also reports good business for thus far in advance of the meeting.

"A large number of firms which have not exhibited in road shows before have reserved space in the St. Louis Arena, and the list of exhibitors signed up reveals that the 'show window of the highway industry,' as the road show is called, will be as full as ever, and will present a more diversified picture of the industry than usual.

"Because of the business slump that has affected many industries, the road show will center nationwide attention and comment on one industry that is making new records of achievement, and has still greater activity in sight for 1931.

"The highway industry knows of no industrial depression—the states and other road building agencies are finishing their greatest year's business, and the road show will be as large and as well attended as ever. The manufacturers who are displaying their products in St. Louis are enthusiastic over prospects for business in the immediate future."

The exhibits at the road show will consist of all types of highway construction and maintenance equipment and materials, including:

Accessories, backfillers, batcher plants, bins, auto truck bodies, batch boxes, breakers, brooms, buckets, oil burners, cabs, cars, carts, com-



pressors, cranes, crawlers, crushers, distributors, ditchers, drags, drains, dredges, drills, elevators, engines, excavators, road finishing machines, flooring, street flushers, forms, fresnos, graders, hammers, heaters, hoes, hoists, hoppers, joints kettles, loaders, locomotives, maintainers, markers, mixers, motors, pavers, pile drivers, pipe, planers, plants, plows, posts, pumps, radiators, rails, reinforcement, rollers, rope, saws, scales, scarifiers, scoops, scrapers, screens, shovels, signals, snow removal equipment, spreaders, sprinklers, subgrading machines, sweepers, tampers, tanks, torches, tools, track, tractors, traffic devices, trailers, trenches, trucks, unloaders, wagons, welders, wheels, winches, wire, wrenches, zone markers.

Snow Removal Methods and Equipment

Effective methods of snow removal and the most modern equipment for this work will be carefully studied in preparation of the report on snow removal by the Equipment Committee of the American Road Builders' Association, whose membership comprises state, city and county officials, and manufacturers of snow removal equipment. Manufacturers' representatives have welcomed the opportunity to assist in this work.

Mr. W. F. Rosenwald, maintenance engineer of the Minnesota State Highway Department, was chosen committee chairman because of his outstanding work in this field. Representatives of manufacturers and highway official groups have been chosen, and an airport engineer will join the committee, as it is pointed out that snow creates a safety hazard on airports where its removal is a very difficult problem and a different one from that of highways and streets.

The progress made by some state departments in the removal of heavy snow was cited by Chairman Rosenwald, who stated that in some cases snow 12 in. deep has been moved at

the rate of 30 miles per hour. He also stated that in many highway departments no preparations are made for snow removal and the problem is left to the regular maintenance organization.

The committee has further discussed all types of equipment: snow removal methods which vary in cities and rural highways; snow control by fences and other devices; the use of chemicals in elimination of icy pavements; spreading sand or cinders over business streets on packed snow; the use of heaters to thaw snow on streets and on airports where the problem is one of disposal rather than removal.

The use of chemicals for snow removal and to prevent accumulation was thoroughly discussed at the last convention of the American Road Builders' Association. The committee is collecting further data on equipment and methods, the amount of snowfall in various states, and the expense of removal. The report will be presented by Chairman Rosenwald at the Annual Convention of the American Road Builders' Association at their national convention in St. Louis, January 10-16, 1931.

A. R. B. A. Representatives at Michigan Road Show

Charles E. Grubb, engineer-executive of the County Highway Officials' Division, and Perry F. Seward, staff engineer, represented the American Road Builders' Association at the Michigan State Road Show just held in East Lansing, Mich.

They reported an excellent exhibition and a most cordial reception extended them as honor guests. Both made many new friends and gained much valuable information through contacts with county highway officials and exhibitors.

Otto Hess, Kent County Engineer, Grand Rapids, Mich., and chairman of the association's county division committee on finance and administration, is also president of the Michigan Association of Road Commissioners and Engineers. In this capacity he was active in putting over the Michigan show. He was assisted by K. I. Sawyer, secretary of the latter organization, and by W. M. Connelly, president, and J. W. Hannen, secretary, of the Michigan State Good Roads Association.

Special Trains for St. Louis Convention

"The President's Special" operated in honor of W. A. Van Duzer, Harrisburg, Pa., president of the American Road Builders' Association, will leave New York City at 6:05 p. m. Jan. 10, carrying de luxe equipment and several Pullman cars of road builders' direct to St. Louis for the twenty-eighth annual convention and road show.

Harry A. Karr, chairman of the Association's Transportation Committee, with the assistance of railroad passenger agents throughout the country has worked out the finest transportation arrangements for this convention ever planned for a national gathering in this country.

A fleet of special de luxe trains will be operated for the road builders' from origin points from Canada to Mexico and from the Atlantic to the Pacific coast.

The trains will be named for historic highways in their localities, and will carry banners denoting them as carrying Road Builders' and it is planned to have a special road builders' menu in the dining cars.

From Vancouver, Seattle and Spokane will come the "Yellowstone Trail Limited"; from Portland and Boise the "Oregon Trail Limited"; from San Francisco, Sacramento, Ogden, Cheyenne and Topeka, the "Lincoln Highway Limited"; from Los Angeles, Albuquerque and Santa Fe the "New Santa Fe Trail Limited"; from Oklahoma City and Tulsa the "Ozark Trail Limited"; from Phoenix and El Paso the "Old Spanish Trail Limited"; from Mexico City, Laredo, San Antonio, Austin and Little Rock the "Pan American Highway Limited";

The "Lone Star Limited" will operate from Dallas and Fort Worth; the "Jefferson Highway Limited" from New Orleans and Memphis; the "Dixie Highway Limited" from Havana, Jacksonville, Atlanta, Nashville and Birmingham; the "Southern National Highway Limited" from Charleston, Columbia, Asheville and Raleigh; the "Atlantic and Pacific Highway Limited" from Richmond, Charleston and Cincinnati; the "National Old Trails Limited" from New York, Philadelphia, Baltimore, Washington, Harrisburg, Pittsburgh, Columbus and Indianapolis; the "Mohawk Trail Limited" from Boston, Albany, Rochester, Buffalo, Cleveland and Galion; the "Dixie Highway Limited" from Detroit, Toledo and Fort Wayne; the "Atlantic Highway Limited" from

Quebec, Montreal, Ottawa, Toronto and Chicago; the "Pershing Way Limited" from Winnipeg, Minneapolis and St. Paul.

All who contemplate attending the St. Louis convention and road show are urged to make reservations on these road builders' special trains through contact with Chairman Karr at A. R. B. A. headquarters, National Press Building, Washington, or by notifying their local railroad representatives. Stops will be made at important points enroute where reservations have been made. Traveling to St. Louis on one of these trains will insure delegates of the finest travel accommodations as well as congenial companions for the journey.

The schedule for the "President's Special" includes departure from North Philadelphia at 7:50 p. m. Jan. 10; Washington, 6:30 p. m.; Baltimore, 7:30 p. m.; Harrisburg, 10:05 p. m.; Columbus, 8:18 a. m., Jan. 11; Indianapolis, 11:15 a. m., arriving St. Louis 4:00 p. m. just in time for the opening social event of the week—a reception in honor of the Pan American delegates, at the Statler Hotel.

November Highway Bond Issues Will Furnish Much Work

More than one-quarter of a billion dollars will be released to swell employment and alleviate the business depression, through highway bonding issues passed in the November elections, according to W. A. Van Duzer, president of the American Road Builders' Association.

Of the total authorization of \$295,800,000 in bonds for highways and bridges, much more than one-half goes directly to labor, Van Duzer declares, as all estimates of direct labor costs involved in highway construction are more than 50 per cent. In some types, such as concrete roads, direct labor costs are 52.4 per cent of the expenditure. Added to these figures are other estimates by road authorities on labor costs for production of the materials and machinery used in road building. These percentages range as high as 30 per cent.

Thus it will be seen that when the states vote to spend another \$300,000,000 for road construction, it means that some \$200,000,000 will soon be added to the payrolls of highway departments, contractors, and equipment manufacturers.

The finances involved in the present consideration include the \$100,000,000 bond issue of Iowa, which was passed some time ago, later declared unconstitutional as a state measure, then taken up by the counties, and this vote sanctioned reimbursement of the counties by the state for highway expenditures.

Also included were the New Jersey bond issue of \$83,000,000; the Louisiana issue of \$75,000,000; Wyoming's \$2,800,000; and the Golden Gate Bridge and Highway District bond issue of \$35,000,000 for a bridge across the Golden Gate in California. The new Wyoming highway bond issue is equivalent to a re-issue of the 1919 issue of \$2,800,000 which was retired July 1, 1930, nine years ahead of date, entirely from receipts from motor vehicle license fees.

This financing will permit Wyoming to take up the increased Federal Aid appropriation and is considered, according to Van Duzer, as but the forerunner of similar action by other states, particularly if the new Congress authorizes immediate distribution of federal funds for 1932.

Forty-two state legislatures which meet this winter will undoubtedly act on much highway legislation, in view of the fact that road bonds may now be marketed at a good premium; the present low prices of materials which have decreased the cost of construction; and the emphasis placed upon increased construction as an aid in the unemployment crisis.

"Money spent for public improvements gives the dollar a double value," says Van Duzer, "for in addition to the value of the improvement there is the dollar placed in circulation in the hands of the individual worker."

"Bond issues will continue to be economically sound as long as motor vehicle fees are used to pay off the indebtedness, because those revenues are continuing to increase in amount each year."

"Cities throughout the nation also will go a long way in solving their local employment problems if they take advantage of present conditions in meeting more rapidly the demand for more streets to take up traffic congestion. No community can say today that it has enough improved highways or streets. As more public funds are put in circulation for the construction of public improvements, business conditions will rapidly improve. Such activity has a strong influence upon private business."

New Equipment and Materials

New Line of Dumping Units

A complete new line of dumping units for light chassis has been announced by the Wood Hydraulic Hoist & Body Co., Detroit, Mich. More than twelve types, of various capacities, are included.

Four hoist models are offered. All are built on the well known hydraulic principle developed 19 years ago by the Wood organization. The bodies,



Wood Type C-12 Heavy Duty Contractors' Dump Body with Wood G-1 Hydraulic Hoist

known as the C-type, are ruggedly constructed of 10 gauge high-resistant steel electrically welded. Sides are flanged. No bulging or bending. Coal bodies have flared sides. Tailgate strongly reinforced. Swings up or down. Adjustable. Lowers flush with body floor. Tailgate presses against end of body sheet, making tight-fitting joint when closed. Tailgate rigidly built from one-piece pressed steel, turned in and welded to body sides as a brace.

Body subframe built of two 4-inch channel longitudinals and five 3-inch channel cross-members.

Low mounting is one of the important new features of these bodies. Several types have full length running boards covering rear dual wheels. The complete line includes contractors' bodies, coal bodies, garbage bodies, wet mix and gravity bodies.

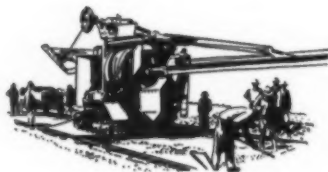
New Power Scoop

A power scoop designed to handle any loose, fluid material such as sand, gravel, cement, etc., has been brought out by the Clark Tractor Co., Battle Creek, Mich.

The standard bucket holds 9 cu. ft. or 1500 lb., though larger cubic capacity



The "Clarktor" Shovel

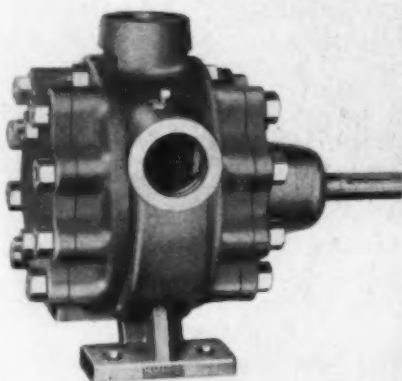


buckets are furnished when material to be handled is lighter than sand. Improved hydraulic cylinders enable driver to pick up and hold the load at any desired point. The scoop approaches the pile, takes its load and carries it away easily and quickly, dumping it where it is wanted. Two models of different heights are available, one having an under-bucket clearance, with bucket in dumped position, of 3 ft. 9 in., and the other of 6 ft. 5 in.

The chassis is a sturdy tractor having a turning radius of 108 in. Standard truck transmission, multiple disc clutch and Clark truck axle are features. Equipment includes starter, generator, battery, head and tail lights.

New Hydraulic Pressed Pump

A new hydraulic pressure pump for use on tilting concrete mixers, elevators, hoists, dump wagons, dump trucks, graders, snow plow and other contractors'



Roper Hydraulic Pressure Pump

equipment, is a product of Geo. D. Roper Corporation, Rockford, Ill.

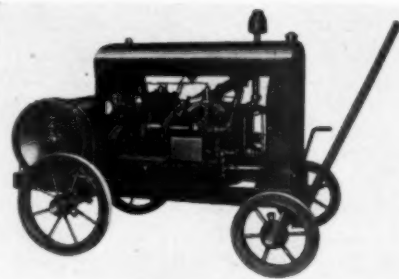
The pumps are of full ball bearing design, with extra close bolt spacing on face plates to prevent distortion under pressure, have a latest design leak-proof stuffing box and Cooke Seal Ring, and are built for direct motor drive. Any unit can be furnished stripped or mounted for motor, belt, or chain drive.

Each size pump is designed for a certain capacity, making possible the correct ratio between the face and the diameter of the gears for most efficient operation. Herringbone type rotary gears are used, eliminating trapping of oil when the teeth mesh, increasing the mechanical efficiency of the outfit, reducing slippage as teeth come together at a point, and insuring quietness of operation. Each pump is automatically lubricated as the gears run in a bath of oil.

New Small Size Thor Six Portable Air Compressor

The Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill., is manufacturing a small size air compressor which has a displacement of 74 cu. ft.

The design of the unit compares with the larger sizes of Thor compressors and uses a LeRoi 4-cycle, heavy duty, engine. This engine has a 3 3/4 in. bore by 4 1/2 in.



New 74 Cu. Ft. Thor Compressor

stroke and is used in conjunction with a two cylinder compressor of 4 1/2-in. bore by 4 1/2 in. stroke.

The compressor is very compact, which makes it readily portable and easily handled. The unit is complete in every respect with full automatic air pressure control, carburetor slow down for idling when running unloaded, Zenith carburetor, Eiseman high tension magneto with impulse couplings and air cleaners. It has an A. S. M. E. riveted type air receiver and a water circulating pump.

It is furnished in both skid mounted and rubber tired wheel mounting types.

Speeder Announces 3/8-Yd. Shovel

The pioneer manufacturer of full revolving, full convertible, 1/2-yd. gasoline engine powered shovels announce a new, full revolving, 3/8-yd. machine. Speeder Machinery Corporation of Cedar Rapids, Iowa, states that this machine incorporates all of the features of their 1/2-yd. shovel, and in addition other features so necessary to high speed traveling and operating conditions.

With a 14-ft. boom and 10-ft. dipper sticks as standard equipment this unit employs a 41 hp., 4 cyl. motor. The



Speeder Model A 3/8-Yd. Convertible Shovel

shovel boom may be removed and either a 22 ft., 24 ft. or 26 ft. boom for crane or dragline operation may be attached. Either a trench hoe or a skimmer scoop may also be used. Other specifications of this new unit follow:

Electric lights and starter as standard equipment.

Optional two or four speed transmission.

Fully enclosed cab.

Speeder patented cable crowd.

Five swing revolutions per minute.

Travel, 3 m.p.h.

14-in. tread shoe.

Very short tail swing.

Interchangeable truck mounting.

Overall width, 7 ft.

Weight, 10 tons.

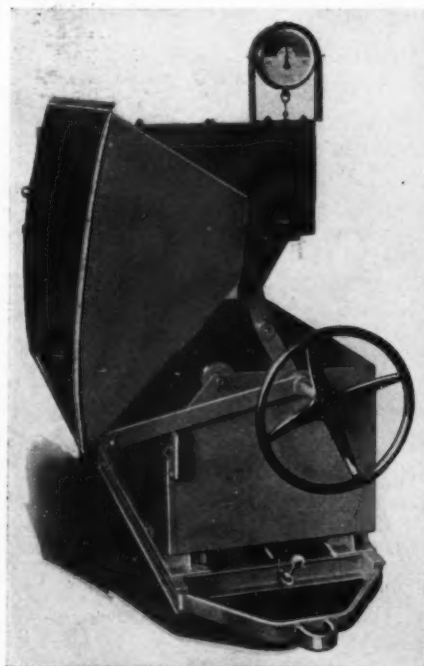
All gears enclosed and running in oil.

Speeder Corporation is now in full production on this new model. This gives them a range of sizes including $\frac{3}{8}$ -yd., $\frac{1}{2}$ -yd. and $\frac{3}{4}$ -yd. machines. The company will be pleased to send further information on request.

Weighing Batcher for Aggregate

A convenient device for quickly and accurately measuring predetermined amounts of concrete aggregates by weight has recently been developed by The Knickerbocker Co., Jackson, Mich. It is known as the "Tilt-Weigh" batcher.

Operating entirely independent of the mixer, it can be used to charge any type of mixer equipped with a power loading skip. It is positioned in close proximity to the end of the mixer ship and may be charged by the most convenient and practical method conditions permit. If stock piles are adjacent, materials may be shovelled in. If stock piles are not close enough for this method, materials may be wheeled and dumped into the batcher hopper from a low platform easily constructed of wood. Certain unusual layouts would permit spouting of materials, but ordinarily the wheeling method is most practical, especially on bridge construction.



Knickerbocker Tilt-Weigh Batcher

Scale is constructed with two weigh arms—the sand arm having a capacity of 1,100 lb., the stone weigh arm a capacity of 2,100 lb.

"Tilt-Weigh" Batcher is built in two sizes—2-bag and 3-bag 1-2 $\frac{1}{4}$ -4 mix. The hopper of the 2-bag size will hold 13 cu. ft.—the 3-bag, 19 $\frac{1}{2}$ cu. ft.

New Grade Ripper

A new grade ripper, a worm gear and wheel control has been brought out by the Contractors Machinery Corporation, Batavia, N. Y. The machinery is equipped with a universal hitch, or drawbar attachment, which permits it to be operated either directly from the tractor or by a chain hitch.

The new method of tool attachment is simple and effective. It not only holds the tooth in a definite and prearranged position, but defines the angle of the entrance of the tooth into the surface. The Trojan grade-ripper is provided with special shaped teeth suitable for conditions on which it is to be used, or the type of work to be performed. There are certain conditions where the straight pointed teeth are satisfactory, and other conditions where the flared or smoke-head teeth are much more effective.



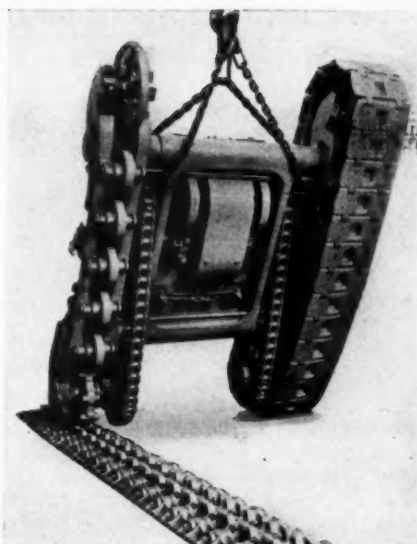
Trojan Grade Ripper

Special designs will be furnished on specifications of the user. All types of teeth are made from high carbon open hearth steel, heat treated to withstand wear.

New Mounting for Bucyrus-Erie Draglines

Bucyrus-Erie Co. of South Milwaukee announced that its E-2 Diesel dragline is now regularly equipped with a new style, improved, crawler-type mounting. This mounting comes with standard or special long belts and with special wide treads. The standard mounting has 27-in. treads giving an overall width of 10 ft. 6 in. with an overall length of 13 ft. 8 $\frac{1}{2}$ in. and a bearing area of 51.9 sq. ft. There is also a long truck with 27-in. treads and this as well as the standard truck can ride on a flat car without removing the treads. The long truck with the 27-in. treads has the same width as the standard but is 15 ft. $\frac{3}{4}$ in. in overall length with a bearing area of 57.9 sq. ft. Two styles of wide treads are also offered. The standard length truck with wide treads has an overall width of 11 ft. 8 in. with an overall length of 13 ft. 8 $\frac{1}{2}$ in., a bearing area of 63.3 sq. ft. This wide truck, wide tread mounting also comes in the extra long size giving a bearing area of 70.8 sq. ft. with an overall width of 11 ft. 8 in. and an overall length of 15 ft. $\frac{3}{4}$ in.

The machine steers from the cab having



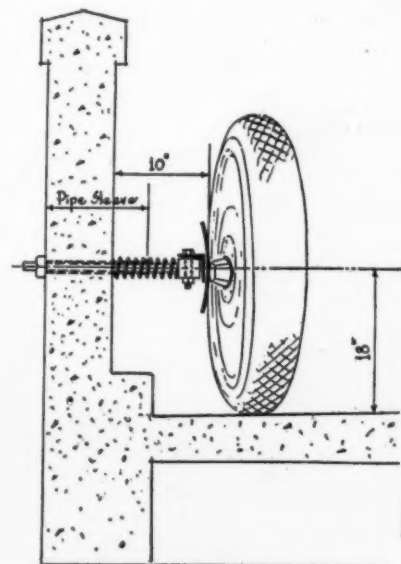
Underside View of Crawler Trucks

several interesting developments for more convenient steering. The new mounting is chain driven being somewhat similar to the crawler mounting used on the 1020 and 1030.

All Steel Highway Guard

An all steel highway guard is a recent product of the Standard Iron Works, 926 Penn Ave., Scranton, Pa. The guard consists of a 10 in. x $\frac{1}{4}$ in. steel plate reinforced with 2 $\frac{1}{2}$ in. x 2 in. steel angle, 1 in. spiral bolts with paper sleeves and springs, 6 in. steel channel supports with rounded tops and pressure plates at ground level and bottom of posts. The springs mounted on the 1-in. bolts provide a cushioning action when impacted by the tire or hub of any motor vehicle. The guard is set up 10 in. from the supports and works in unison with springs and bolts and together a cushioning action is provided.

The guard can be mounted on steel, concrete or wooden posts, concrete or stone walks or bridge abutments.



Standco Highway Guard Mounted on Concrete Bridge Railing

New I-R Compressor for Outdoor Service

A new 2-stage, air-cooled, electric motor-driven air compressor that can be used in outdoor or exposed locations throughout the year without danger of freezing is a recent addition to the Ingersoll-Rand line. The outfit is made in two styles; a direct-connected unit for installations that are fairly permanent, and a V-belt-driven unit for contractors and others who desire a semi-portable machine.

This compressor, Type "TLC," is particularly applicable to structural steel work and general contracting service, since it requires no water connections. The compressor and its driving motor are mounted on a single subbase, making a compact, self-contained unit that may readily be moved. A lifting bale can be



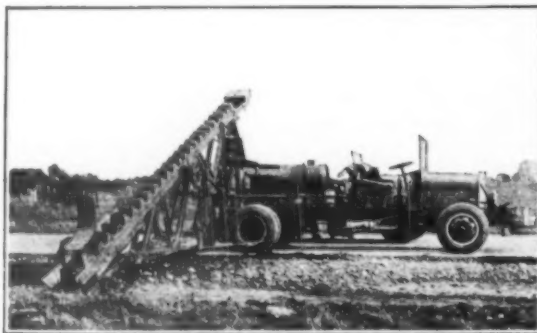
New I-R Compressor

attached to facilitate moving from floor to floor, or for handling on and off a truck.

The "TLC" has a piston displacement of 155 cu. ft. per minute and is designed for 100 lb. discharge pressure. It is delivered ready for use as soon as lubricating oil is supplied and power connections are made. Lubrication is automatic. Control is automatic and the machine operates only when air is being used. Ball bearings are used on both motor and compressor and require no adjustment. An airsealed unloader protects the motor by unloading both cylinders and inter-cooler whenever the compressor stops.

Shoulder Finishing Machine

A new machine for finishing road shoulders has been brought out by the George D. Whitcomb Co., Rochelle, Ill. This new tool is stated to form the shoulder and ditch contours with mechanical precision, shaping, smoothing and carrying off the excess dirt in a single operation.



Whitcomb-Lehmer Shoulder Finishing Machine

The ingeniousness of the shaping device is in keeping with the unusual transmission, which is of dual type and permits a range of speeds to accommodate the machine to any soil conditions that may be encountered in the shouldering operation. In the case of heavy, clayey soil the rate of travel is as close to worm-pace as the condition requires. When the soil is normal the speed is accelerated.

The device consists of elevating buckets operating on a rigid boom, mounted on a heavy duty Sterling truck chassis, having an auxiliary transmission especially designed to give the necessary slow speeds and powered with an 80 hp. Waukesha 6-cylinder engine. The grade is maintained by a hydraulic hoist controlled by the boom assembly. The buckets travel across the shoulder and ditch contour, conveying the excess soil up and over the machine, loading it into a dump truck which travels along beside it. When not in service the finishing unit can be dismantled, releasing the truck for general work, or it can be trailed from one operation to another at a speed up to 25 miles per hour.

On a 30-mile stretch of Indiana highway the use of this machine is stated to have enabled the contractor to work and have his entire shoulder and ditch contour accepted at 30 per cent of his former costs per mile of highway. Completing from two to three miles of shoulder per day permits the elimination of the usual worries and difficulties arising from this operation.

The machine can be operated on the highway without interrupting traffic.

Combination Backfiller and Blade Plow

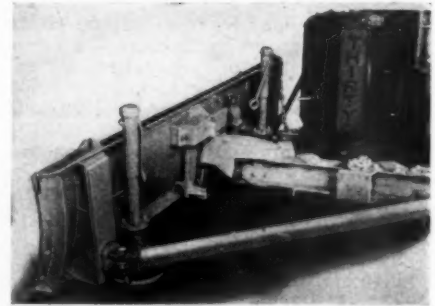
A number of improvements have been made in the combination backfiller and blade plow of the Laplant-Choate Mfg. Co., Cedar Rapids, Ia. Some of those improvements are:

Newly designed blade pivot box which allows the blade to oscillate freely at all times, giving a full floating blade.

A much shorter blade which lessens the gap between those jobs where it was previously a question as to whether a bulldozer or a backfiller would be the better tool.

Chain adjustments, which are used to hold either end of the blade down, even to the extent of having the low end of the blade held down to cut approximately 20 in. below the track level.

A moldboard which has been designed with an improved roll which enables the



LaPlant-Choate Backfiller

blade to cut in with a slicing action when set at an angle, rolling the material to the side with the least bit of effort. The same roll is also much better for carrying the load when the blade is set squarely in front for bulldozing work.

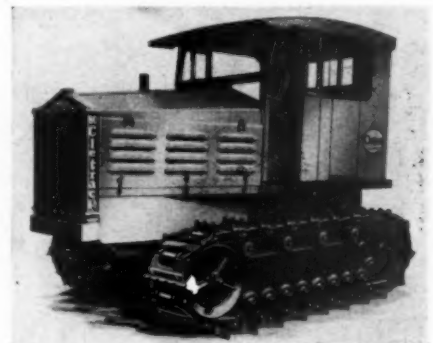
The advantageous principle of an overhanging blade on the delivery side for counteracting side draft is one of the important features. This allows the tractor to remain on safe and solid ground while delivery is being made over a bank or into a ditch.

The new improvements allow the blade to have 10 in. clearance from the ground when the blade is set at an angle, and 12 in. when set for bulldozing work.

A new special side wing has been developed for use where the soil is subject to cave-ins, and can be furnished on request. The short side blade can also be used to good advantage at the forward end for use as a land side bumper blade to minimize the tendency of the blade to draw in too deeply.

Tractor Equipped for Winter Use

The illustration shows the 80-60 Cletrac of the Cleveland Tractor Co., Cleveland, O., equipped for winter use, including a completely enclosed cab and ice grouters on the tracks.

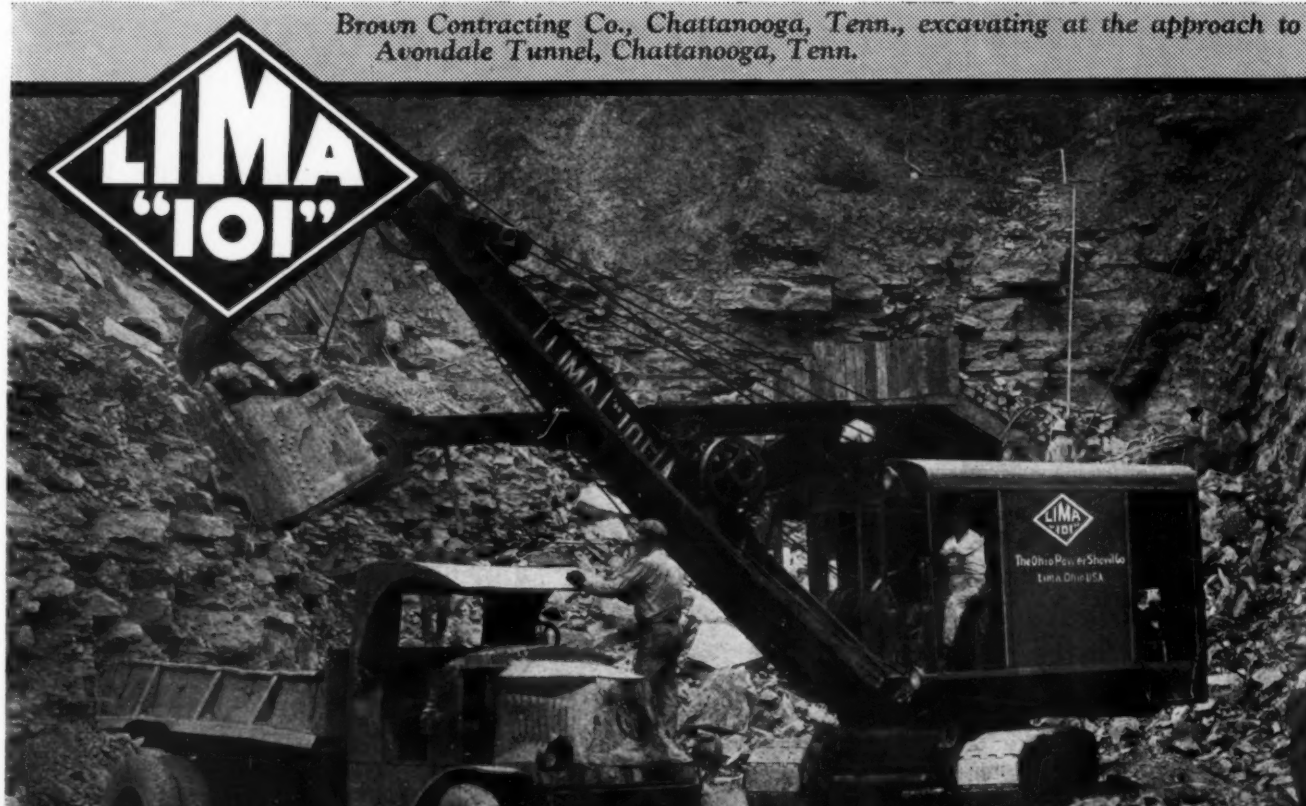


80-60 Cletrac Equipped for Winter Use

This tractor is equipped with an electric starter which eliminates hand cranking and makes it possible for the driver to operate the tractor with the greatest of ease and comfort, making it unnecessary for him to leave his protected position in the cab.

Headlights may also be quickly installed and connected to the electrical generating unit for night use of the machine when required.

Brown Contracting Co., Chattanooga, Tenn., excavating at the approach to Avondale Tunnel, Chattanooga, Tenn.



Meeting Every Requirement of the Toughest Jobs

The LIMA "101" meets every requirement of the toughest job. Its oversized construction and reserve power enables it to master every class of excavating suited to a shovel of 1¼ yard capacity.

No other shovel in the world offers so many profit making features. Pressed steel boom and dipper handle construction, one solid piece cast steel upper frame, single line hoist and Timken roller bearings at every vital bearing point, are but a few of the features that make the LIMA "101" the most popular shovel, dragline, crane and dragshovel on the market today.

The Ohio Power Shovel Company

Division Lima Locomotive Works Incorporated

LIMA, OHIO

Western Office
846 Straus Bldg.,
Chicago, Ill.

Canadian Representatives
The General Supply Co. of Canada, Ltd., Ottawa, Ont.
Tye Machinery Co., Ltd., Vancouver, B. C.

Eastern Office
2351 Graybar Bldg.,
New York

LIMA "101"

Distributor News

Echoes from International Road Congress

Every day brings in reports of some of the interesting exhibits that were shown at the International Road Congress held in Washington, D. C., recently, and news items about the foreign visitors who since the close of the Congress have been traveling about the United States before returning to their own countries. Much time has been spent in studying highway systems and American made equipment.

A Word from Siam

L. Prinya Yogavibulya, a distinguished delegate to the Congress from Siam, made a tour of the highways of the South with a party of highway engineers from all parts of the world. He is making a study of the latest ideas to be used in the development and maintenance of the highway system in his own country.

Mr. Yogavibulya is Highway Engineer, Department of Ways, Ministry of Commerce and Communications, located at Bangkok. His photograph was secured through the courtesy of the Caterpillar Company whose plant he visited during his cross-country trip.

In speaking of the transportation systems of his own country, Mr. Yogavibulya said: "The Siamese highway and railroad systems are two branches of one department of the government. I am under the chief of the department of ways, who in turn is under the national director of transportation. We have some 3,000 kilometers of highways under construction, maintenance and improvements, about 1,000 kilometers being under each of those three heads.

"The coming of the automobile, of course, has brought a demand for more and better roads in Siam just as it has in all other countries of the world," explained Mr. Yogavibulya. "We have quite a comprehensive development system

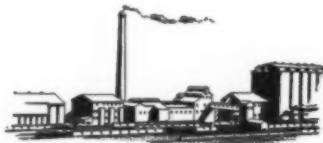


L. Prinya Yogavibulya, Highway Engineer, Bangkok, Siam

planned for our country the next few years, building, maintaining and improving the roads as taxes and budgets permit."

Visitors Stop in Milwaukee

A large delegation from the Congress, including visitors from 23 foreign nations, made a tour of the Great Lakes Region and stopped off at Milwaukee, that great center of machinery manufacturers, to



ranged from radiators to tractors and shovels. Allis-Chalmers, the Trackson Company and Wehr were included among the tractor exhibitors.

Morton R. Hunter, chairman of the industrial division of the Milwaukee Association of Commerce had charge of the



They Come from Spain

Manuel Carrera Diez, Moises Barrio Duque, Rafael Egonez, Francisco M. Figueras, Fernando Moran, Eduardo Pena, Carlos M. Prim and Federico Twell. The Spanish sign says: "Welcome delegates of the International Road Congress. Allis-Chalmers cordially invites you to inspect its tractors for every industrial and agricultural purpose."

view products of twenty-four Milwaukee and Wisconsin plants.

An exhibit of Milwaukee-made machinery formed a huge circle along the city's lake-front yard, so that the visitors were able to conveniently make an inspection of the equipment and have their questions answered by experts. Equipment shown

entertainment arrangements and exhibit.

At Washington

Two of the exhibition booths at the Show in Washington which attracted considerable attention were those of the Barber Asphalt Company featuring Trinidad Lake Asphalt pavements, and the one of



BAD WEATHER



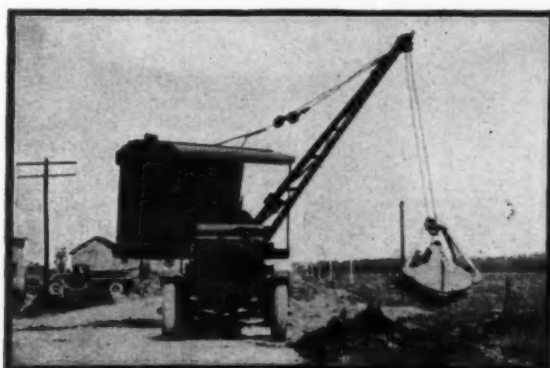
shows how good they are

IT TAKES BAD WEATHER to show how good a money maker a Universal Truck Crane is. Right now they will help finish up 1930 jobs on time, rain or shine. And when regular jobs are completed the machine need not be idle. • Bridges that need repair, snow removal, ditches that need opening up, steel erecting, coal unloading, highway repairs, all can be handled at a profit by a Universal Truck Crane. • Regardless of the weather, your Universal can get to the job . . . traveling at motor truck speed on the highway, or with the sure traction of the Motor Truck (Christie) Crawler, when the going is tough.

THE UNIVERSAL CRANE CO. • Lorain, Ohio



A few hours work erecting steel on a small bridge made money for the owner of this Universal



A Universal Truck Crane is always loaded—always ready to go



Snow-bound streets are quickly opened up by Universals

UNIVERSAL

Yes—we would like you to mention ROADS AND STREETS.



Shinto Fujii, C. E., Dept. of Home Affairs, Tokio, Japan. The Sign Says, "Welcome" to Him in His Native Tongue

the New York and Bermudez Company.

The striking feature of these exhibits was the manner in which pictures were lighted to give the effect of motion, and the automatic Balopticon Machine which threw on the screen street scenes from different countries, including the United States, England, Spain, Germany, Norway, Poland, Japan, China, India, South Africa, Australia, South America and many others.

The Trinidad Lake booth exhibited a large painting on glass, showing a modern city of the future carrying local traffic on paved street, while on a wider elevated boulevard inter-city express traffic was moving. Look closely at the cut of this picture and you will see in the center at the top Christopher Columbus standing at the bow of his Caravel looking out across the sea. The clouds were made to appear to be in motion and the fountain actually seemed to be in play. Moving signs in

English, French, Spanish and German gave historical data.

The feature picture in the New York and Bermudez booth was of natives digging from Bermudez Asphalt Lake in Venezuela, South America. Here, again, the effect of motion was secured in clouds and rippling water. At this booth attractive booklets printed in three foreign languages, descriptive of the Bermudez products and giving specifications, were distributed to the visitors.

Many Changes Announced by Caterpillar

The Caterpillar Tractor Company of Peoria, Illinois, has seen many new assignments in the sales department with the following lineup:

J. J. Crumbaugh, manager of the New York office has been transferred to the export department and assigned to work abroad. Arthur C. Jenvey, who has been assistant sales manager at Peoria, has been transferred to New York as manager of that office. W. H. Goodwin, who has been assistant sales manager in charge of the Denver sales division, has been sent to Peoria as general assistant sales manager to E. R. Galvin, sales manager.

A. E. Loder, general supervisor of construction and governmental sales has been transferred to the newly formed experimental and development division, which has headquarters in San Leandro, California. Mr. Loder will be the eastern representative of this division. C. A. Spears, supervisor of construction and governmental sales at San Leandro, has been sent to Peoria to succeed Mr. Loder.

L. G. Lawrence, district representative in Ohio, has been transferred to the western division as district representative at Los Angeles. Sam M. Miller, recently associated with Caterpillar, has been assigned to the territory as district representative formerly covered by Mr. Lawrence.

C. D. Price, special representative of the sales department in Peoria, has been transferred to the western division as district representative out of San Francisco. R. I. Wallingford, former district representative in the Amarillo territory has been assigned to special work. P. R. Ferrell has been made district repre-



R. H. Gardner, recently assigned to Washington, D. C., to represent the Caterpillar Tractor Company

sentative in the territory formerly covered by Mr. Wallingford.

F. M. Stewart, district representative at Great Falls, Montana, has been assigned to special work. H. G. McClurg has been appointed district representative in the territory recently covered by Mr. Stewart. A. H. Snow, former district representative in the Grand Forks territory, has been transferred to the export department and will eventually be assigned to work abroad.

T. V. Marks, formerly on special work, has been appointed to succeed Mr. Snow. L. W. Werner, has been assigned to the Glendive, Montana territory. E. I. Stouffer will be assistant sales manager in charge of the Eastern portion of the Eastern sales division.

F. F. Beall Made Director Continental Motors

Announcement has been made of the election of F. F. Beall to the Board of Directors of the Continental Motors Corporation. In 1926 Mr. Beall resigned from the Packard Motor Car Company to engage in the development of a new motor-fuel called "Gyrol" in conjunction with the Pure Oil Company and the Dawes Brothers of Chicago. This product is said to be meeting with a cordial reception, particularly in high-compression engines.

Mr. Beall received his early training with Brown and Sharpe Company. Since then his activities have been many and varied.

Personnel Changes

A. A. Wilmot, who has been a member of the New York sales department of Wickwire Spencer Steel Company for the past five years, has recently been made assistant sales manager in charge of structural products at the Chicago office, 208 South La Salle Street.

G. L. Crawford, who for the past four years has been a member of the staff at Chicago for this company, has been transferred to the Tulsa, Okla., office, as assistant sales manager.



Owners of good homes prefer concrete streets



Concrete-paved Ivanhoe Street, Oakland, California. Hussey & Belcher, Engineers; Fredrickson & Watson, Contractors

There is *character* to concrete streets that is in perfect accord with the character of the most exclusive residential neighborhood. There is a *durability*, even despite constant traffic, that assures year after year service without repair annoyance and expense. There is *safety*, in all weather, in the smooth but gritty surface of portland cement concrete that is imperative in street paving *everywhere*.

PORTLAND CEMENT *Association*

Concrete for permanence

33 W. GRAND AVENUE
CHICAGO

Please mention ROADS AND STREETS—it helps.

Colonel Charles R. Gow A Sketch

Colonel Charles R. Gow is so well known in the engineering field, that a few details concerning him and his achievements seem timely in view of the fact that he is now at the head of one of the largest paving companies in the world.

Formerly president of the Gow Company, Inc., of Boston and more recently Postmaster of that seaport city, Colonel Gow has recently accepted the presidency of Warren Brothers Company of Boston. He is a consulting engineer of prominence, the author of many books and articles on engineering subjects and is chairman of the Metropolitan Planning Division of Massachusetts, a position he will continue to hold. He is a native son of Massachusetts and because of his public service and connection with military affairs has long been identified with his State.



Colonel Charles R. Gow

Colonel Gow was born in Medford, in 1872 and in 1893 graduated from the Engineering School of Tufts College. Twenty-six years later his alma mater conferred on him the honorary degree of Doctor of Science. He has been a lecturer at Massachusetts Institute of Technology for several years.

He served as assistant engineer of the Boston Transit Commission, having charge of the building of sections of the Tremont Street subway and the East Boston Tunnel and has also done important engineering work in connection with the New York subway. He invented what is known as the Gow caisson method of installing foundations. In 1915 he was elected president of the Boston Society of Civil Engineers in recognition of his ability.

In 1912 he served on the Commission appointed by Governor Foss to investigate the water supply in several communities in the Ipswich River Valley, and was chairman of the Metropolitan Water Supply Investigating Commission appointed by Governor Cox. He served as chairman of the Boston Licensing Board and chairman of the New England Joint Committee of Thirty appointed to study the St. Lawrence River navigation and power project. In 1925, at the request of Henry I. Harriman, then chairman of the Metropolitan Planning Division of

Boston, whom he has since succeeded, he made an extensive study and report on the port of Boston, which investigation was carried on under legislative enactment.

From 1899 to 1908 he was an active member of the Massachusetts National Guard, at the end of which time his name was placed on the retired list as lieutenant colonel of engineers. His record included service in the Spanish American and the World wars. During the last war as a member of the construction division of the U. S. Army in charge of the Boston Army Supply Base, expenditures under his direction involved more than \$25,000,000.

An evidence of his high ideals and broad human interests is shown in the appointment of Colonel Gow to the newly founded chair of Humanics of the Massachusetts Institute of Technology. This department was established for the instruction of students in the fundamentals of human nature.

He was appointed Postmaster of Boston by President Hoover on February 1, 1929, and although in office but a short time, it is said that he has effected many important changes resulting in a high degree of efficiency.

In his position as active head of Warren Brothers both his executive and engineering skill will be given wide range, for this company is said to be engaged in paving work in all parts of the globe. Foreign projects under construction by them in 1930 include work in Cuba, Hungary, Poland, Japan, Spain, China, Australia and South America.

Two Bosch Magneto Companies Merge

Announcement has been made of the details which is to unite the American Bosch Magneto Corporation and the Robert Bosch Magneto Company into one organization with the corporate title United American Bosch Corporation.

The merger, it is said, brings to the American Company all the benefits of the research facilities of the Robert Bosch A. G. and goes a long way toward uniting the Bosch efforts throughout the world. Through the consolidation a considerable savings is anticipated due to the more extensive sales and service organization. The United American Bosch Corporation, in addition to the products of its own manufacture, will become exclusive sales outlet in the American territory for the products of the Robert Bosch A. G. of Stuttgart, Germany, while the latter organization undertakes to sell products of the American company through their many European sales branches.

The plan contemplates an increase in the number of shares of American Bosch common stock, part of which will be issued in exchange for all Robert Bosch assets. It is stated the word "magneto" has been eliminated from the title, due to the broadening of the company's activities.

The officers of the United American Bosch Corporation will be Arthur T. Murray, president; Morris Metcalf, vice-president and treasurer; Louis Beeh, G. J. Lang, Leon W. Rosenthal, Hermann Waker, J. E. Wild, vice-presidents; R. W. Washburn, secretary and assistant treasurer. General offices of the company will remain at the plant in Springfield, Mass., with branches in New York, Chicago and San Francisco.



The Quarry

Moose and Music; You're Invited

Open House for three days with good food and good entertainment is the program which the Superior Supply Company is offering to all contractors, their wives and friends December 12th, 13th and 14th at their Chicago headquarters, 1850 South Kostner Avenue.

The purpose of the three day celebration, when all business will be suspended, is entirely that of good-fellowship and renewing old friendships and follows a custom which the Superior Company established several years ago.



The Hunter

This year preparations are being made to serve moose steaks, for Sam Kennedy has been hunting up in Northern Ontario in the Nipigon region and report has it that he has returned with a bull moose and a deer.

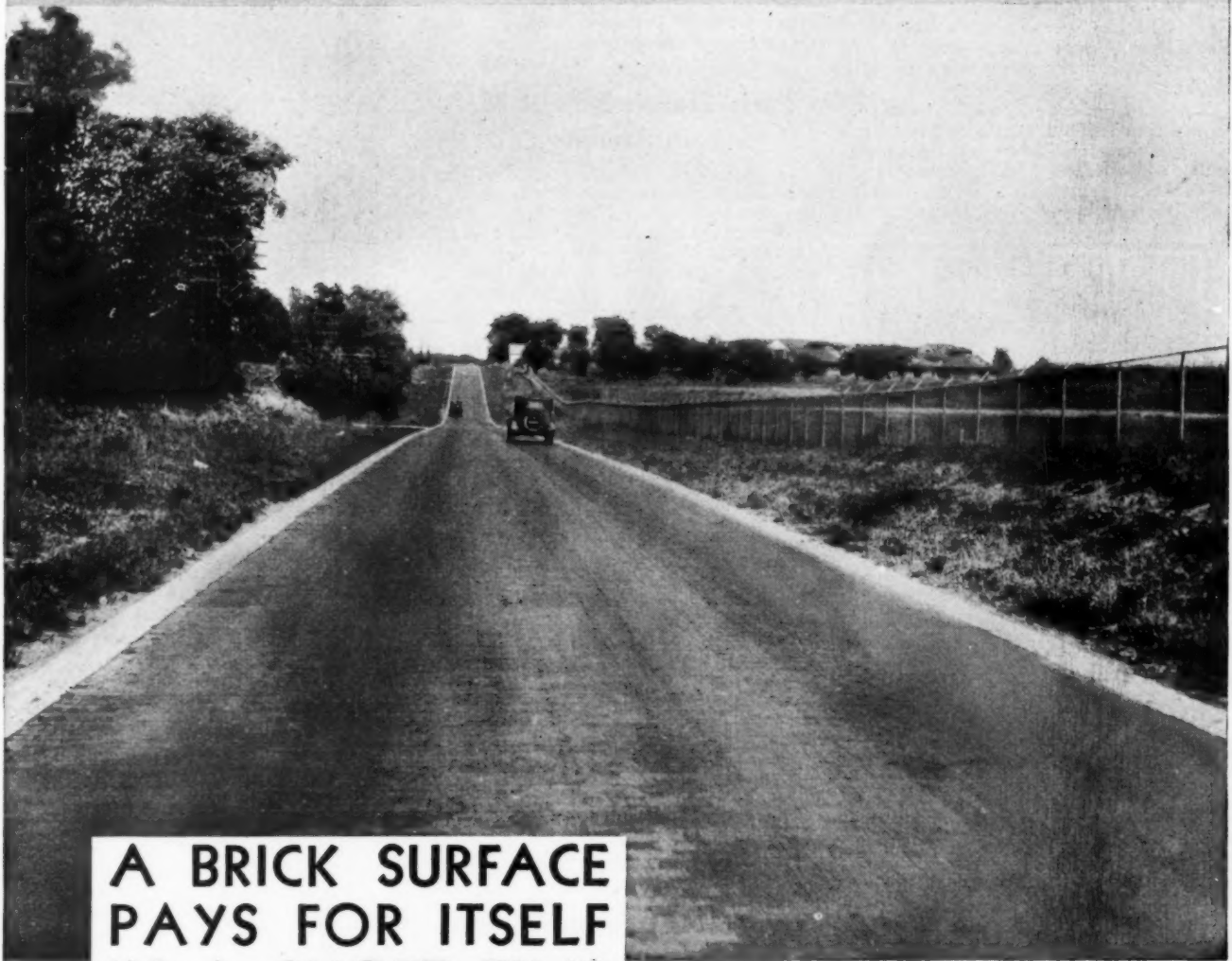
Willard Dow Heads Chemical Plant

The Dow Chemical Company of Midland, Michigan, called a special meeting of the board of directors following the death of Dr. Herbert H. Dow which resulted in the appointment of Willard H. Dow as president and general manager of the company. Mr. Dow has been a member of the board of directors for eight years, has served his company as assistant treasurer for three years, and has acted as assistant general manager for the past four years. His intimacy with the executive policies of the company and his many years of practical chemical experience fit him to head this \$30,000,000 chemical organization.

The Dow company has been a progressive pioneer for the prevention of dust on gravel roads and streets, and Dowflake Calcium Chloride used for this purpose is also used as a concrete curing agent.

Willard H. Dow graduated in the class of 1919 from the University of Michigan with the degree of B. S. in chemical engineering. His practical work in the plant has made him familiar with the manufacturing processes used in producing more than 150 chemical products. He has stated that the progressive research policies of the company will continue to be its distinguishing factor.

PROTECTS AGAINST WEATHER AND TRAFFIC



A BRICK SURFACE PAYS FOR ITSELF IN A SHORT TIME

Expensive traffic slabs should be protected. Otherwise mounting maintenance costs become oppressive as the cracks and imperfections caused by weather grow under the hammering of traffic.

Brick protects the costly pavement base. Water is sealed out. Temperature changes are minimized. Progressive breakage is prevented. The hard, vitrified brick resist abrasion and cushion traffic impact. Thus increased life of the pavement and lowered maintenance costs make a brick surface a profitable investment.

Announcements

THE NATIONAL
PAVING BRICK
MANUFACTURERS
ASSOCIATION
1245 National Press
Building
Washington, D. C.
will be an
EXHIBITOR
at the 1931
Road Show A.R.B.A.
St. Louis
January 12-16

Twenty-fifth
Annual Meeting
of the
NATIONAL
PAVING BRICK
MANUFACTURERS
ASSOCIATION
will be held at
WILLIAM PENN
HOTEL
PITTSBURGH, PA.
Brick Paving
Technical Sessions
Feb. 5-6, 1931

VITRIFIED

BRICK PAVEMENTS

FACE THE FUTURE - PAVE WITH BRICK

Henry Harnischfeger

News items of November 15th carried notice of the passing of Henry Harnischfeger, president of the Harnischfeger Corporation, one of the pioneer machinery companies of Milwaukee.

Mr. Harnischfeger was 75 years old at the time of his death and his life's history as reported in his autobiography which was published in December, 1929, is the typical romance of the foreign born boy coming to America and fight-



Henry Harnischfeger

ing his way to success against many hardships.

Born in Salmuenster Kreischlichtern, Hessen Nassau, a very old German town, in 1855, Mr. Harnischfeger was educated in a Franciscan monastery and considered becoming a monk. Abandoning this idea and also the thought of working as a tailor, he was apprenticed to a locksmith. When 15 years old his mother died and he persuaded his father to allow him to come to America.

His first work in this country was with the Singer Sewing Machine Company, making machine parts. For a few years he worked in various machine shops in and near New York and in 1877 journeyed to Milwaukee to take a position as foreman in the Whitehill Sewing Machine Company. Alonzo Pawling was a wood patternmaker for this company and later started the Milwaukee Tool and Pattern Company. Mr. Harnischfeger had loaned money on a mortgage to this company and later he and Mr. Pawling formed a partnership under the name Pawling & Harnischfeger which continued for many years. In 1910 a stock company was formed and eventually Mr. Pawling due to ill health relinquished his interest in the business some time before his death in 1914.

Glancing through the pages of Mr. Harnischfeger's autobiography one finds many names of manufacturing companies who have made history in the machinery business with whom Mr. Harnischfeger had dealings and in many cases which were started by men associated with him or by companies in which he had financial interests.

In 1892 Mr. Harnischfeger married Miss Marie E. Kauwertz and of his four children, two survive him, a daughter and his son Walter Harnischfeger who is identified with the Harnischfeger Corporation.

Paris-Transit Mixers Meet in January

January 9-12, inclusive, are the dates announced for the annual convention of the members of the National Association of Paris Transit Mixed Concrete Manufacturers. St. Louis is to be the convention city. Porter W. Yett of Portland, Oregon, is president of this association and E. A. Landis, executive secretary.

Portland Cement Association Elects Kinney Vice-Pres.

Wm. M. Kinney of Chicago was elected vice president of the Portland Cement Association at its annual convention. Mr. Kinney's selection for this position of additional responsibility comes after twelve years service as general manager of the association, during which time the organization has increased its membership to ninety-five independent cement companies and greatly extended the scope of its operation. Other officers elected were Frank H. Smith, New York City, chairman of the board of directors, and George F. Coffin, Nazareth, Pa., treasurer. The president, it is stated, will be elected at a later date.

The Portland Cement Association has its national headquarters in Chicago. It occupies a five-story reinforced concrete building at 33 West Grand avenue. District offices are maintained in thirty cities throughout the United States.

Novo Announces Changes

The Novo Engine Company, Lansing, Mich., announces the appointment of Mr. Ed. B. Goodwin, as their Eastern district manager.



Bon Voyage

M. A. Waldo on board the liner, President Garfield, as it is leaving San Francisco harbor, enroute to Honolulu, Japan, China, the Philippines and Straits Settlements in the interest of the Novo Engine Company of Lansing, Mich.

Mr. Waldo expects to spend the next year in a special survey to ascertain the extent of the present and potential market for power units and contractors' equipment in the Far East.



Ed. B. Goodwin

Mr. Goodwin has been placed in charge of the New York office located at 811 Graybar building. Sales, repair parts and service for the Eastern district are handled from this office.

Mr. J. A. Winkler has been appointed as Mr. Goodwin's assistant.

Altree of American Bosch Retires

According to recent report, A. H. D. Altree, who has spent twenty-one years with the American Bosch Magneto Corporation, twelve of these years as vice-president, has resigned from the corporation to retire from active business.

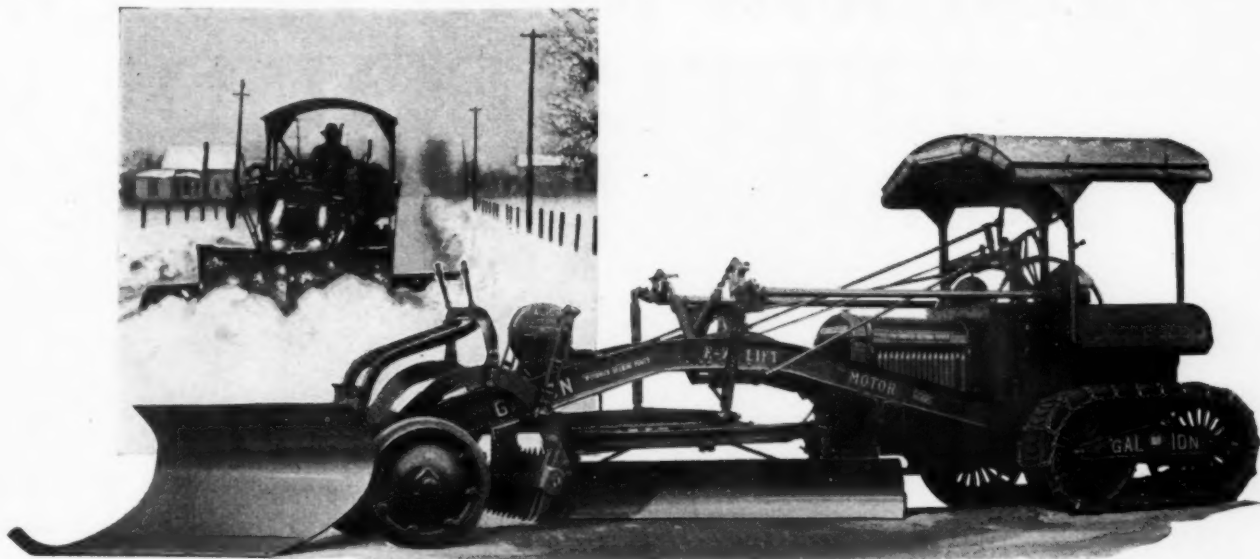
In confirming the report and expressing his regret over Mr. Altree's action, Arthur T. Murray, president of the organization, stated: "I had grown to look upon his administration of the manufacturing sales division of our business after all these years as a fixture without change. One of the oldest members of our organization from the standpoint of service, Mr. Altree has watched and guided many manufacturers throughout their automotive history. His acquaintance in the industry is unusually wide and his friends are legion. His faithful and constructive service to this organization has been fruitful and his translation of our policies to our customers has won us many permanent friends."

Mr. Altree has been connected with the automobile industry since its beginning, serving as secretary of the Daimler Motor Syndicate, Ltd., of London, England and general manager of the Daimler Motor Company, Ltd., and manager of the first electrical carriage company in London. He joined the magneto industry as manager for Frederick R. Sims, then holding the Robert Bosch Magneto sales agency in London.

He traveled around the world investigating possibilities and requirements of magnetos, and then became manager of the Chicago branch of the former Bosch Magneto Company of New York. Following his success in Chicago he was transferred to the New York headquarters as vice-president.

On the formation of the American Bosch Magneto Corporation with its operations at Springfield, Massachusetts, Mr. Altree joined that company.

NO SNOW-BOUND ROADS



with a GALION SNOW PLOW on the Job

Galion Distributors

W. A. Adams Tractor & Equip. Co., Raleigh, N. C.
 R. S. Armstrong & Bro. Co., Atlanta, Ga.
 O. B. Avery Co., St. Louis, Mo.
 Badger Tractor & Equip. Co., Milwaukee, Wis.
 W. D. Banker Road Machy. Co., Memphis, Tenn.
 Banks-Miller Supply Co., Huntington, W. Va.
 Borchert-Ingersoll, Inc., St. Paul, Minn.
 Brown-Fraser & Co., Ltd., Vancouver, B. C.
 Dukehart Machy. Co., Des Moines, Iowa
 Eastern Tractor Co., Portland, Me., Cambridge, Mass.
 Feenaughty Machy. Co., Portland, Ore.
 Frankfort Equip. Co., Frankfort, Ky.
 Good Roads Machy. Co. of N. Y. Inc., New York
 Hall Perry Machy. Co., Butte, Mont.
 Herd Equip. Co., Oklahoma City, Okla.
 Interstate Machinery & Supply Co., Omaha, Nebr.
 Jeffrey Mfg. Co., Ltd., Montreal, Que.
 Jenison Machy. Co., San Francisco, Cal.
 C. H. Jones Co., Salt Lake City, Utah
 Lewis-Patten Co., San Antonio, Texas
 Lewis Tractor & Machinery Co., Fargo, N. D.
 Miller & Requarth, Springfield, Ill.
 Morrow Auto Co., Albuquerque, New Mexico
 H. W. Moore Equip. Co., Denver, Colo.
 Morrissey Easton Tractor Co., Vicksburg, Miss.
 Murphy & Murphy, Little Rock, Ark.
 Northfield Iron Company, Northfield, Minn.
 C. T. Patterson Co. Inc., New Orleans, La.
 G. C. Phillips Tractor Co. Inc., Birmingham, Ala.
 Power Equip. & Service Co., New Haven, Conn.
 F. Ronstadt Co., Tucson, Ariz.
 Salina Tractor & Thresher Co., Salina, Kan.
 Bert Smith, Enid, Okla.
 Smith-Booth-Usher Co., Los Angeles, Cal.
 Standard Road Equip. Co., Rockford, Ill.
 W. H. Stoutenburg, Penn Yan, N. Y.
 Tennessee Tractor Co., Nashville, Tenn.
 F. E. Vaughn, LaCrosse, Kan.
 Richmond Machy. & Equip. Co., Richmond, Va.
 Welch Good Roads Supply Co., Welch, W. Va.

Roads are quickly cleared of snow and kept clear wherever a Galion Motor Grader Snow Plow is on the job. Powered by the famous McCormick-Deering 10-20 Industrial Tractor with Galion Sure-Trac Rubber Crawler, there is ample power and traction to move snow rapidly.

The snow plow opens a six foot path which the blade widens, at the same time moving the snow to the outside of the road. A runner is placed at the front to carry the plow over obstructions. Relief springs permit this action, yet hold the plow to its work. The deeply curved blade, which rolls the snow in a great furrow, can be set at any angle sharp enough to move snow easily, clearing a wide track.

Removing the snow plow and changing the blade converts the machine into a motor patrol grader unmatched in strength and performance. A dual-purpose machine, giving all year service.

Full particulars upon request



The Galion Iron Works & Mfg. Co.

Galion - - - - - Ohio

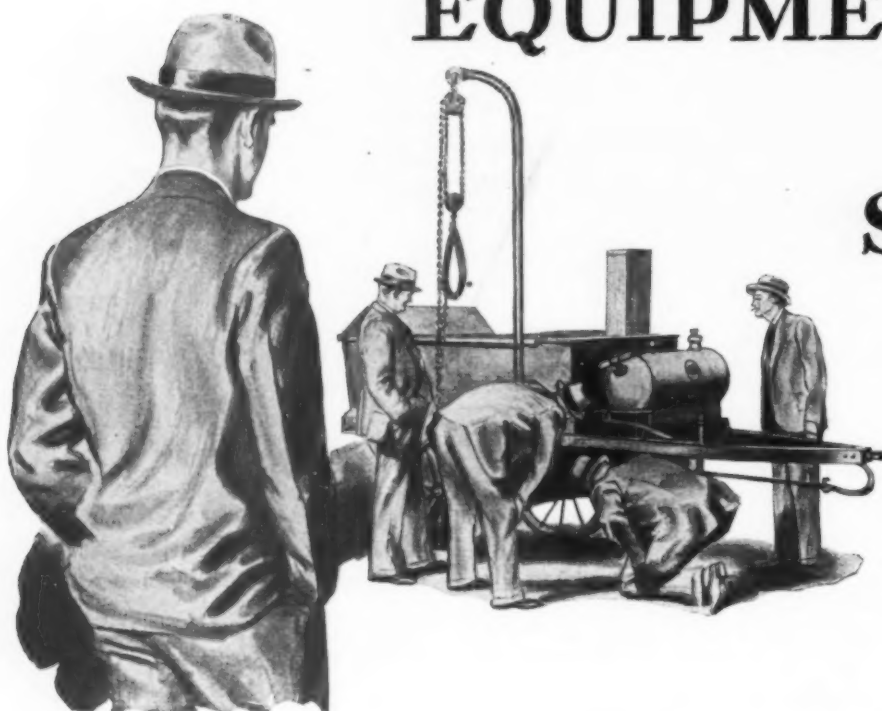
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Asphalt and Emulsion
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Water Heaters and
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Joint Fillers
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Tools and Pots
Traffic Line Markers
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454 E. Pearl St.
Cincinnati, Ohio

Gentlemen:
Without obligation to me
send your complete catalog
showing Littleford Road
Maintenance Equipment.

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Title.....

Street Address.....

City.....State.....
12-30

The Annual Convention and Road Show of the American Road Builders Association is an event looked forward to by everyone engaged in highway work. It is a vacation and an education combined.

In just a few weeks many of you will be heading for St. Louis. When you get there, we want you to keep your weather eye peeled for the large LB Sign of a Good Heater that marks the Littleford booth. There will be new equipment that we want you to see. We're not saying a word about it now, because we intend to surprise you!

By the way, it would be a good idea to look over our catalog before you go to the show. Have you a copy handy? If not, fill out the coupon and mail it. We'll send the catalog by return mail.



Reg. U. S. Pat Off.

LITTLEFORD

Road Maintenance Equipment
SINCE 1900

LITTLEFORD BROS. 454 E. PEARL ST. CINCINNATI, O.

Yes—we would like you to mention ROADS AND STREETS.



CAST IRON Culverts

serve a double purpose—
drainage and support

WHEN it comes to a question of what kind of culverts to place under your streets or highways, consider the advantages which U. S. Cast Iron Culverts offer.

U. S. Cast Iron Culverts withstand the shock and vibration of present-day heavy traffic. They are unaffected by sudden temperature changes. And, they have a high resistance to rust and corrosion.

Road engineers who pride themselves on the speed of their construction and the permanence of their work specify U. S. culverts for strength, durability and ease of installation.

U. S. Cast Iron Culverts are easily handled—quickly installed in any kind of weather by unskilled labor. Carefully manufactured to meet the specifications of all State Highway Departments. Shipped in lengths to meet your road requirements.

U. S. Culverts are today rendering efficient and dependable service under thousands of streets, highways and railroad embankments in all parts of the country. Write for complete information. Also inquire about deLavaud Pipe which is centrifugally cast for greater strength and greater carrying capacity.

**United States Pipe
and Foundry Co.,**  **Burlington, N.J.**

Sales Offices:
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Our pipe bears the "Q-Check"
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**HAND OPERATED STEEL PULLER
FOUR PAWL ROTATION**

A light sinking drill of advanced engineering design with an exceptional performance record. Weighs only 50 lbs.

MODEL 11



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HELD
DRILLS**

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Detroit, Michigan

Attention Mr. J. H. Barnes

Gentlemen:

In response to your letter of the 17th our Federal trucks, which we have on that these same wheels which we pleased to advise you 19th, 1927, are still in use and our records indicate we have had no expense in connection with them.

They have been and are in daily service and at this time are apparently in as good condition as ever. Naturally our thoughts have not changed and we are 100% for Budd equipment.

Very truly yours

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BUDD WHEEL COMPANY, DETROIT

It makes the difference between Car on the road and Car in the Ditch

Protect the Public



A HIGHWAY is a road built for public service. And highway officials are selected, first: because they know road requirements; second: because they recognize their responsibility to the public they serve.

We have yet to meet a highway official not deeply concerned over accidents—anxious to protect travelers at danger points. This accounts for the widespread use of PAGE HI-WAY GUARD.

Page Hi-Way Guard is yielding, elastic—but no lunging car has yet been able to break through. Each wire, each mesh, grabs instantly its share of the load and hangs on for dear life—a positive but gradual check that saves lives and property.

Page Hi-Way Guard is easily aligned. Thorough galvanizing weather-proofs it and makes it visible at night. It deforms little under heavy impact. Great safety at little cost.

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obligation.*



PAGE "HI-WAY" GUARD

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The Lifeline of the Highway

>>> CLEAN
 FOOLPROOF
 EASY TO USE
 TIME-SAVING
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CONTRACTORS, nation-wide, are choosing this modern curing agent to advantage in keeping costs down.

On the average job, one man does all the curing. Only one application needed—one pound per square yard of surface. There is no sprinkling required. Time and labor costs are saved from beginning to completion of job.

Grasselli "R-B" Silicate of Soda has pioneered this curing process and met with outstanding success.

It is a standard product made by an organization with 91 years of chemical experience and is carefully supervised to insure quality and uniformity.

This most economical concrete road curing method is being successfully used under various climatic conditions from Canada to the Gulf States inclusive.

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BRANCHES IN 19 CITIES

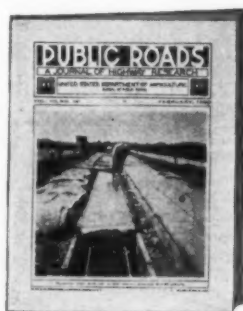


Curing Costs
Cut . . .
 WITH

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Silicate of Soda



After thoroughly testing and investigating Silicate of Soda curing under various climatic conditions, the U. S. Bureau of Public Roads Engineers have approved its use on all Federal Aid Projects.



Ask for "Curing Concrete Highways", sent free upon request—full of helpful information on curing concrete this better and more economical way.





. . . . and all that's needed for the curing job is one man, a spreader, and some Calcium Chloride



Method of curing concrete by the use of Calcium Chloride on the surface or as an admixture are both approved by the United States Bureau of Public Roads.

No big final clean-up is needed where concrete roads are cured with a surface application of Flake Calcium Chloride. After the man with the spreader applies the Flake Calcium Chloride on the surface, this clean white material takes care of itself just as it takes care of the entire curing operation. No need for constant sprinkling and inspection, either.

No wonder Calcium Chloride has been chosen to do the curing job on thousands of miles of the best concrete highways. Besides assuring perfect curing, the Calcium Chloride methods provide advantages that appeal to everyone concerned with a concrete road, from the men who plan and build it to the taxpayers who pay for it and use it.

The full facts are presented in the information which will be furnished by any of the companies sponsoring this advertisement. Write today and ask for booklet 942.

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CALCIUM CHLORIDE

CURES CONCRETE

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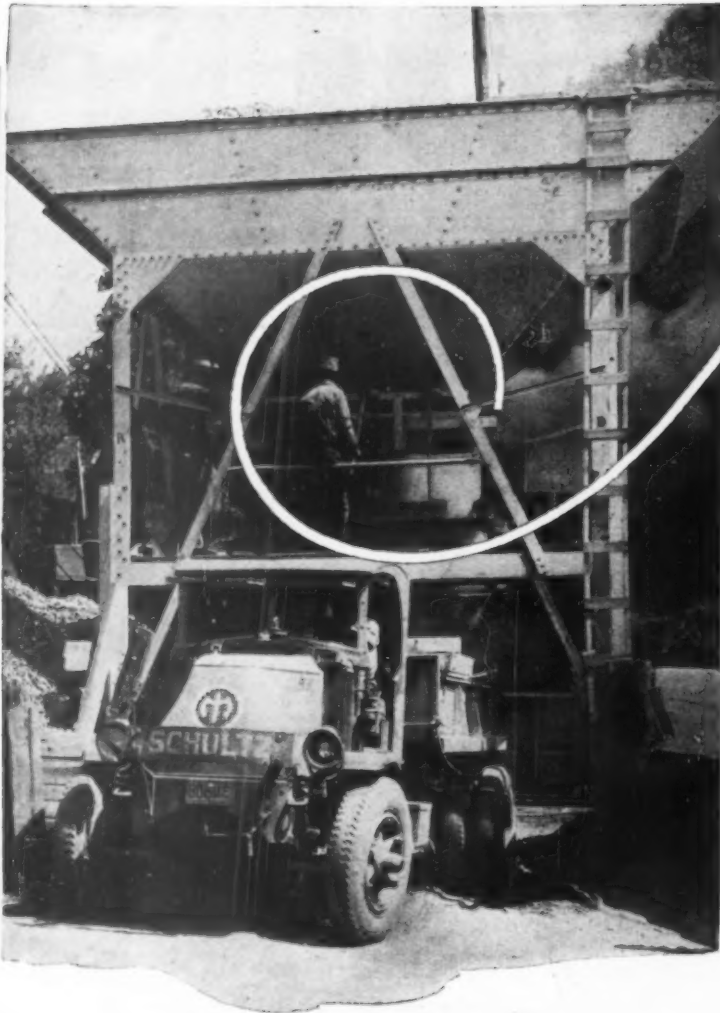
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* money*

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**Butler
Weighing
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* Loss of loading time, over-weighing of aggregates and inaccuracies in batching—which must be corrected—may increase the truck time at the batching plant 50% to 250%.

BUTLER Weighing Hoppers are made with a full knowledge of field conditions and a wealth of actual contracting experience. Inaccuracies in weighing—and consequent losses—are eliminated by quick-operating gates and highly accurate weighing equipment. Losses in operating time and in the waiting time of trucks are reduced to a bare minimum by Banked Controls which are one-man operated.

You can't afford to eat up profits with useless handling costs. Let us tell you how Butler Bins and Batchers will cut your costs.

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Representatives in fifty cities.



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ON COUNTRY ROADS

■ HERE'S the "Caterpillar" Twenty Trailer Patrol filling in ruts, carving down bumps, smoothing washboards. Grateful motorists soon can travel this rebuilt road in speed and safety. The cost? Unbelievably low, for big power, ample traction and a non-chattering blade do the work with magic swiftness.

Prices—f. o. b. Peoria, Illinois

TEN	\$1100
FIFTEEN	\$1450
TWENTY	\$1900
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SIXTY	\$4175

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PEORIA, ILL. and SAN LEANDRO, CALIF.,
U. S. A.

Track-type Tractors Combines Road Machinery

(There's a "Caterpillar" Dealer Near You)



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... For Maximum Drainage Economy use



(Above) Solving drainage problems—laying half round, flat bottom GOHI Culverts in streets of Alameda.

(To left) Installing 24" GOHI Corrugated Culvert on Dixie Highway near Falmouth, Ky., made necessary because of collapse of rigid type.



(Meet copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.)

Use GOHI Culverts for
Reservoir Syphons and Outlets
Highways
Real Estate Developments
Golf Courses
Airports
Railway Roadbed Drainage
Storm Sewers
Drainage of reclamation areas
Temporary or permanent flumes.

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Corrugated Culverts

THE ever-increasing cost of modern highways is forcing attention on construction economies.

Out of costly experiments with various types and kinds of culvert, has come the conviction that GOHI Corrugated Culverts make for economy in highway construction by lowering drainage costs.

Made of Genuine Open Hearth Iron—pure iron-copper alloy—these culverts give maximum resistance to the corrosive influence of soil, water and weather. Their reasonably low first cost; low-cost

installation; flexibility that resists settling or shifting earth and vibration from traffic; demonstrated durability in countless installations;—these are factors that weigh heavily in lowering your drainage investment.

Whatever your requirements, get all the facts about GOHI Culverts. The more carefully you investigate and compare advantages and costs, the stronger will be your conviction that GOHI is the culvert for you to buy.

GOHI CULVERT MANUFACTURERS, Inc., Newport, Ky.

Lincoln Steel and Forge Co.
St. Louis, Mo.

The Newport Culvert Co.
Newport, Ky.

The Pennsylvania Culvert Co.
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A. N. Eaton, Metal Products
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A bigger, better and more elaborate show than ever before! A gigantic convention of a gigantic industry! Surely you'll attend this greatest of the year's industrial events.

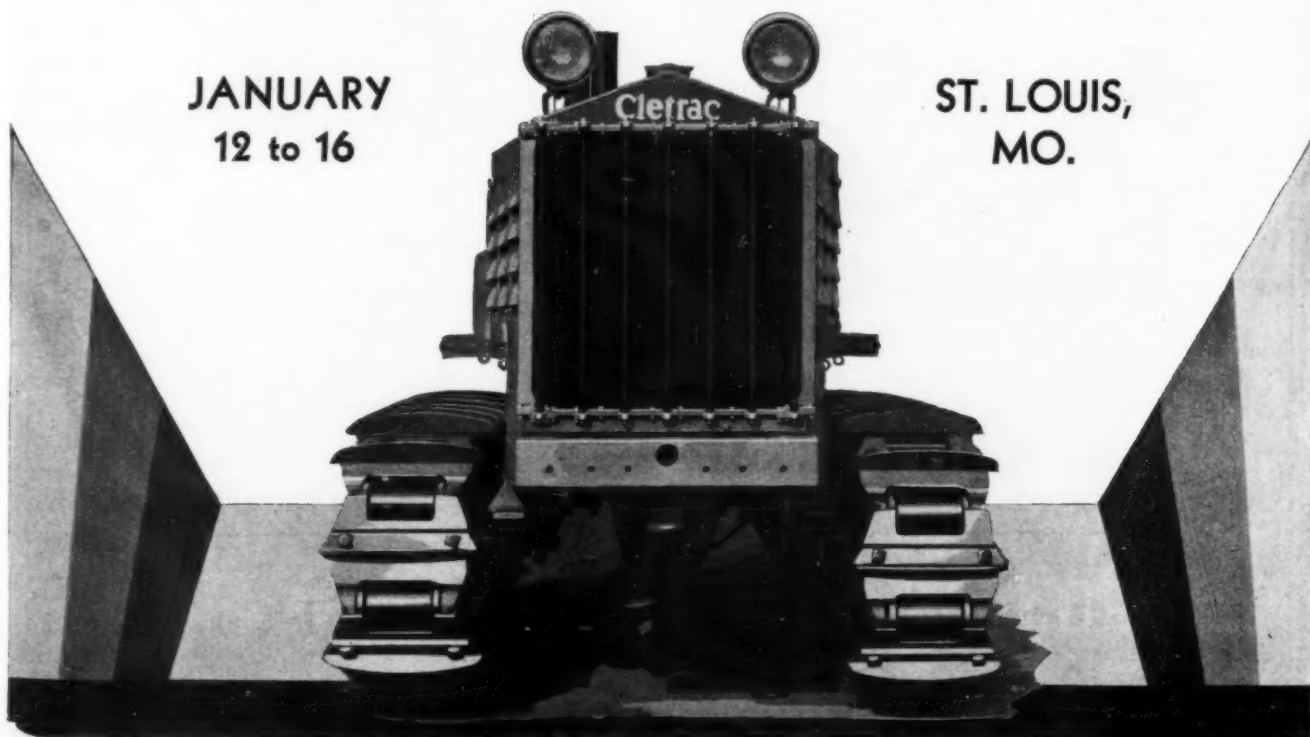
Cletrac extends to you this cordial invitation to visit its booth and hotel headquarters when attending the Show in St. Louis.

The Cletrac Line will be shown in Exhibition Building "A" in adjoining spaces Nos. 24 and 44. This will be one of the high spot exhibits of the Show. You will want to see it — and get first hand the really big facts about Cletrac's complete line of tractors for the road builder, contractor and general industrial user of tractor power.

THE CLEVELAND TRACTOR COMPANY, 19320 EUCLID AVE., CLEVELAND, OHIO

JANUARY
12 to 16

ST. LOUIS,
MO.



Announcing the "QUICK-WAY" TRUCK SHOVEL

THE Contracting and Highway Industries have been waiting for just such a tool as the "QUICK-WAY."

A practical shovel designed and built by practical men, and after completion of development, tried and tested in the field over a period of ten years.

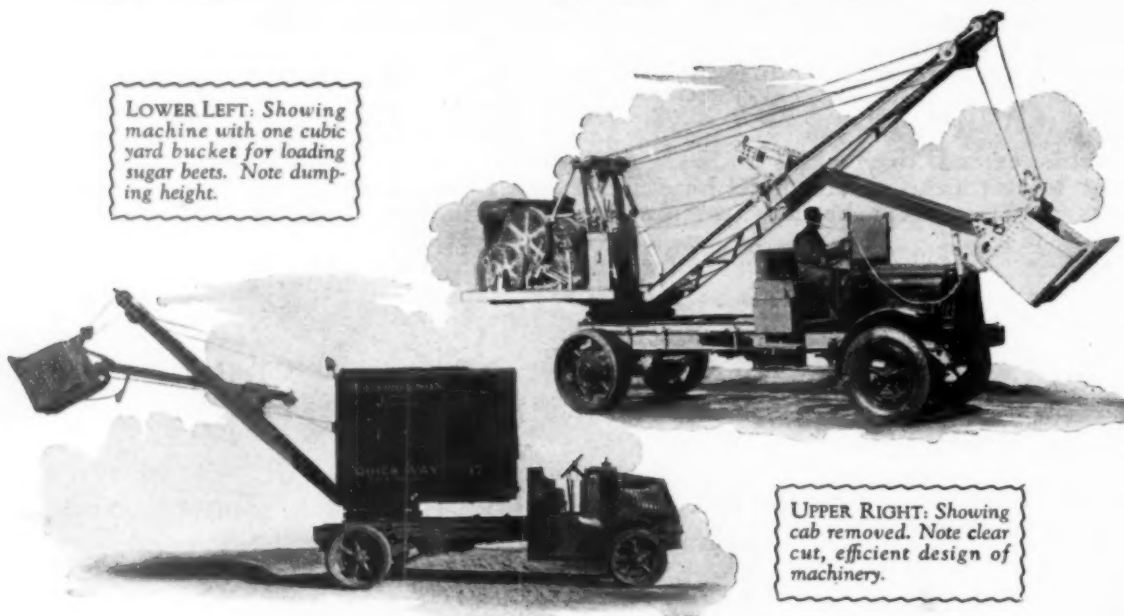
The "QUICK-WAY" was tried and proven in the field, and NOT on the purchaser.

It is fully convertible and has many new features in addition to every old approved requirement.

The "QUICK-WAY" is the only truck shovel on the market, and IS NOT A COMPROMISE in either PORTABILITY or CAPACITY.

Will do your regular jobs and innumerable odd jobs heretofore impossible with a heavy power shovel.

LOWER LEFT: Showing machine with one cubic yard bucket for loading sugar beets. Note dumping height.

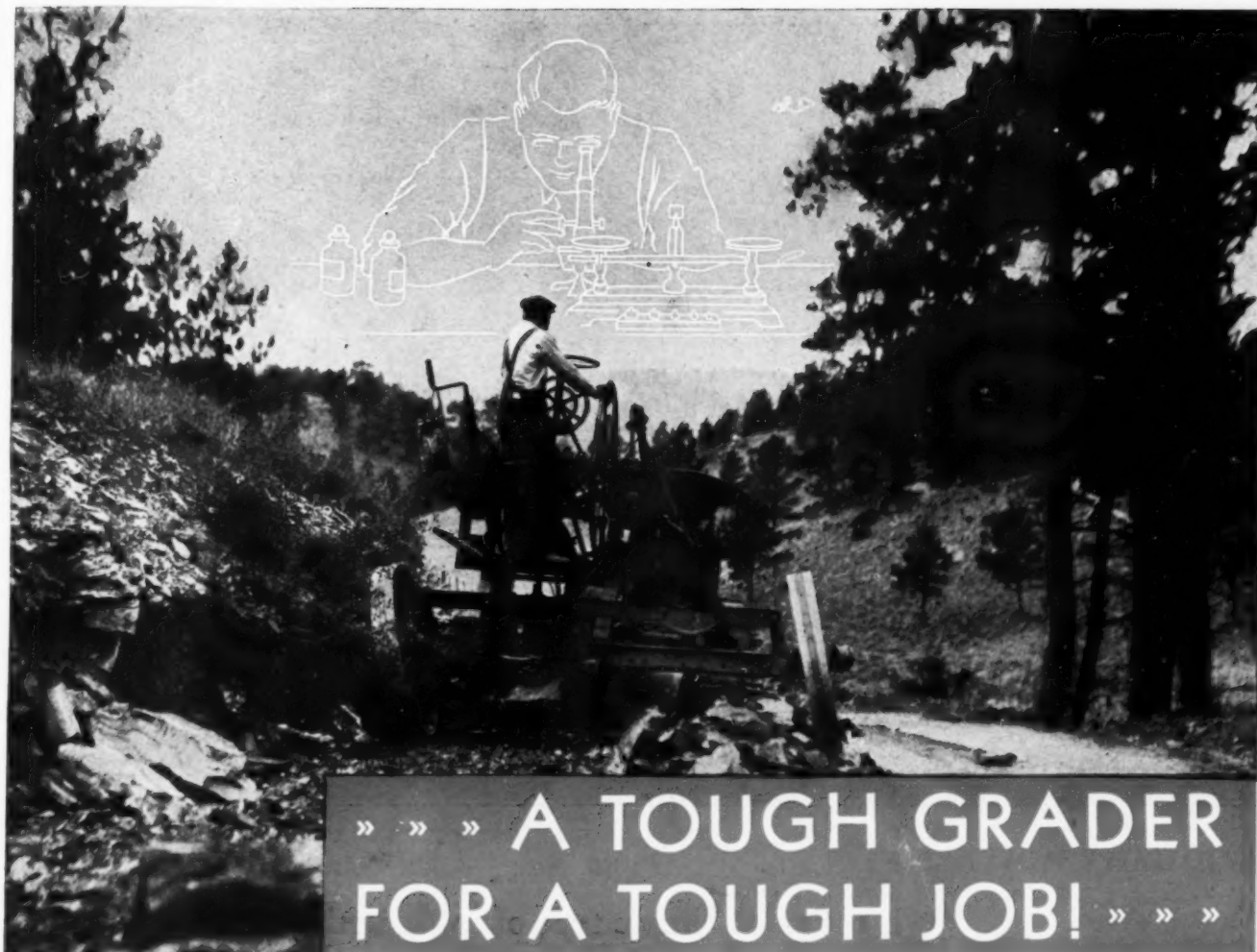


UPPER RIGHT: Showing cab removed. Note clear cut, efficient design of machinery.

Weight, eleven thousand pounds. This shovel has a capacity of four-tenths of a cubic yard, struck measure, and can be mounted on any three and one-half ton truck, or larger.

— "QUICK-WAY" to the Job —
— "QUICK-WAY" to Do It —
— "QUICK-WAY" to the Next One —

"Quick Way" Truck Shovel Co.
DENVER, COLORADO



» » » A TOUGH GRADER
FOR A TOUGH JOB! » » »

The Adams line
includes—

Graders
Motor Graders
Scarifier Graders
Elevating Graders
Dump Wagons
Road Maintainers
Patrols, Drags
Wheeled Scrapers
Drag Scrapers
Fresnos, Plows

BUCKING into a rocky bank! Rear wheels leaned to hold the grader unyieldingly against the heavy cut! Tremendous stresses! A tough job—and it takes a tough grader to handle it!

But ADAMS is a tough grader—and it is built to lick tough jobs. Each part is made of carefully selected material. Special alloys, high carbon steels, malleable and

steel castings, forgings insure great strength without unwieldy bulk, making it easy to operate ADAMS Graders even in large sizes. It costs more to build ADAMS Graders, but they do better work, give longer service with less upkeep—and are most economical in the long run, *always*. You should have a copy of the new ADAMS catalog. Write for it today.

J. D. ADAMS COMPANY, INDIANAPOLIS, IND.

MINNEAPOLIS KANSAS CITY ATLANTA SPOKANE DALLAS MEMPHIS



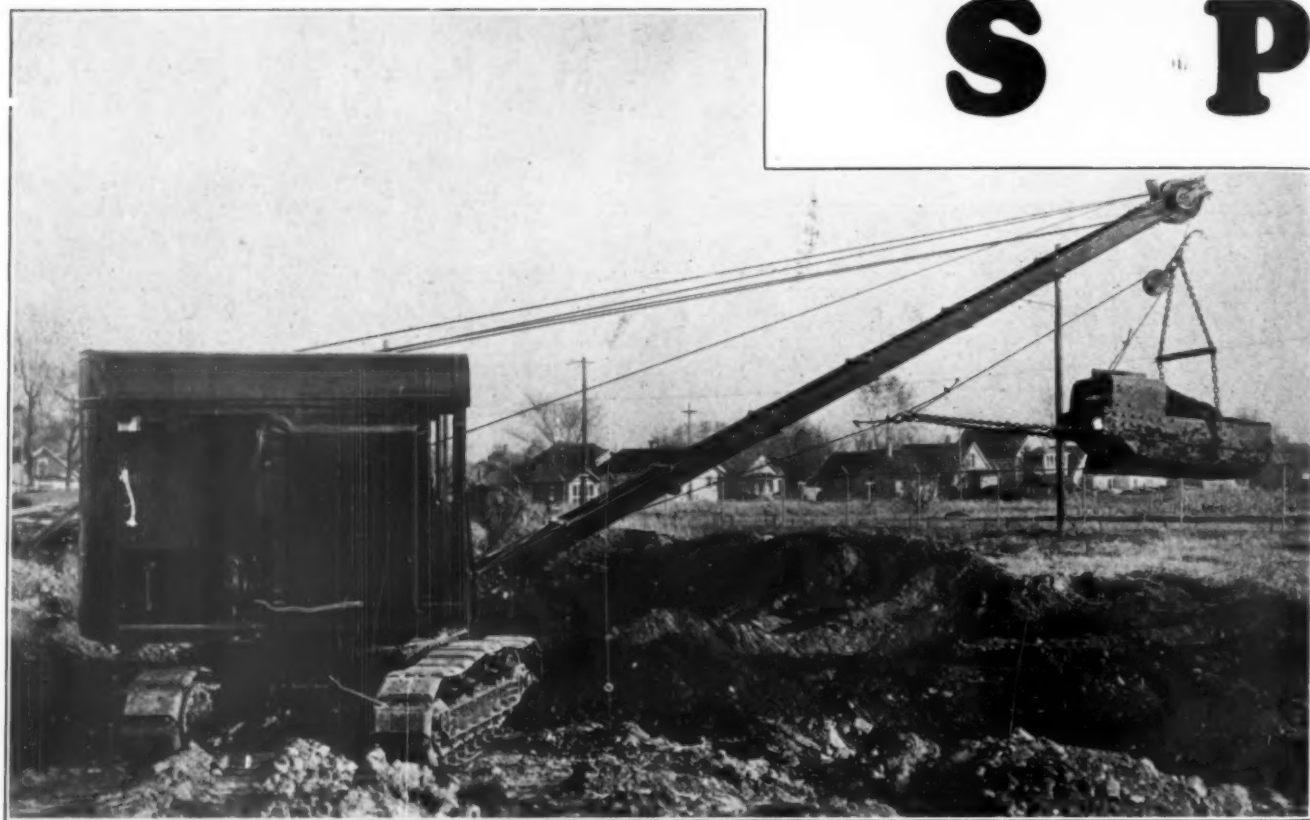
ADAMS

Adjustable Leaning Wheel

GRADERS

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S P



OF the same simple type of construction as the world famous Speeder Model B3, the machine that revolutionized the one-half yard field. All the important model B3 features—such as 2 speeds throughout, on drums, travel, swing, the Speeder patented crowd, light weight, and in addition several other features such as all gears, including travel gears, cut from solid blanks and running in oil-tight cases and the main drums equipped with Timken Bearings. Fully enclosed cab, electric lights and starter, are standard equipment.



PIONEER MANUFACTURERS OF FULL-REVOLVING

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E E D E R

ANNOUNCES

A NEW LIGHT CONVERTIBLE SHOVEL

The Speeder



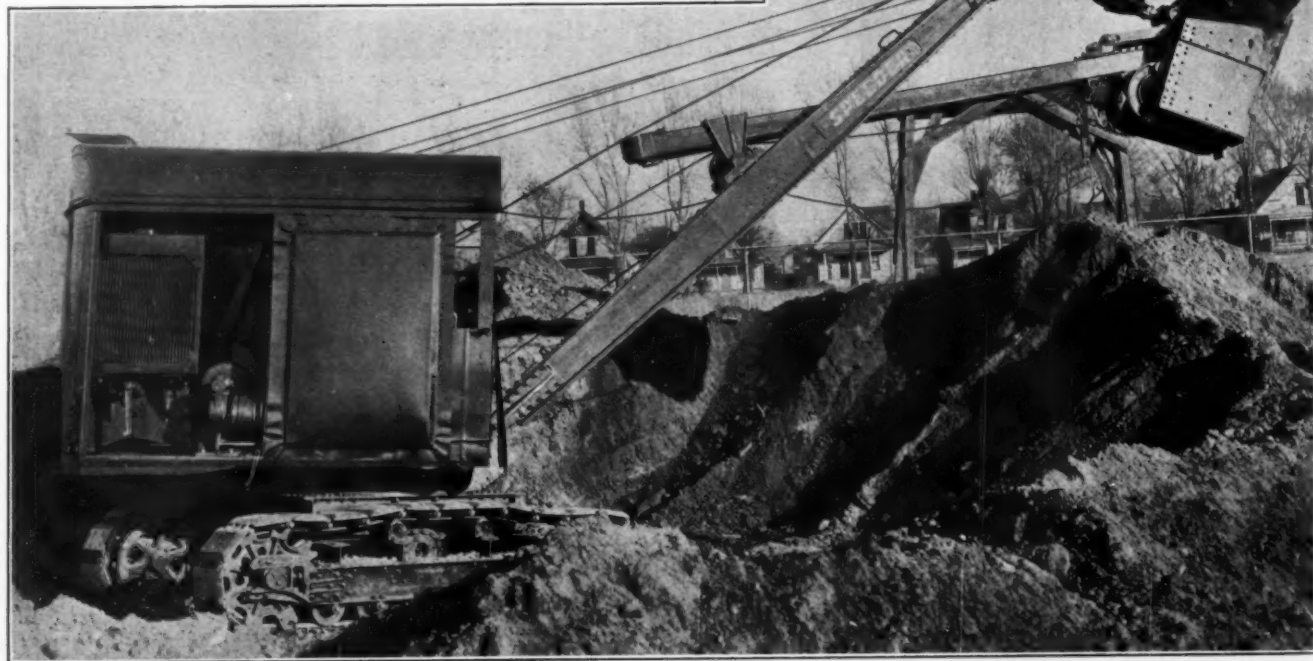
FULL REVOLVING
—
FULLY CONVERTIBLE
SHOVEL
PULLSHOVEL
CRANE
DRAGLINE
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HIGH SPEED TRAVEL
AND
OPERATION THRUOUT

Speeder Machinery Corp.

*Pioneer manufacturers of full revolving, fully
convertible, one-half yard gasoline shovels.*

1201 Sixth Street S. W., Cedar Rapids, Iowa, U. S. A.



FULLY CONVERTIBLE 1/2 YARD GASOLINE SHOVELS

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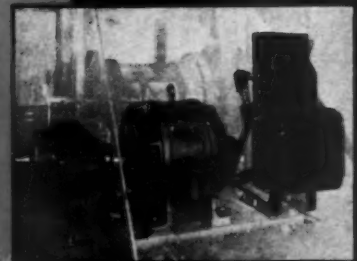


This Electric OSGOOD Conqueror, owned by The Brown Excavating Co., Inc., Shenandoah, Pa., has been in constant operation since Sept., 1928. Mr. Canfield writes: "Despite unfavorable conditions and tough going our OSGOOD has never faltered a minute. We have dug conglomerates and blue rock, sand-stone, coal and clay. With all the yardage it has lifted, our OSGOOD has never been idle due to a breakdown! We find the OSGOOD an ideal digging unit because of its economy, lower power consumption, and steady, constant performance."



SINGLE ELECTRIC MOTOR DELIVERS SMOOTH, QUIET, STEADY, POWER

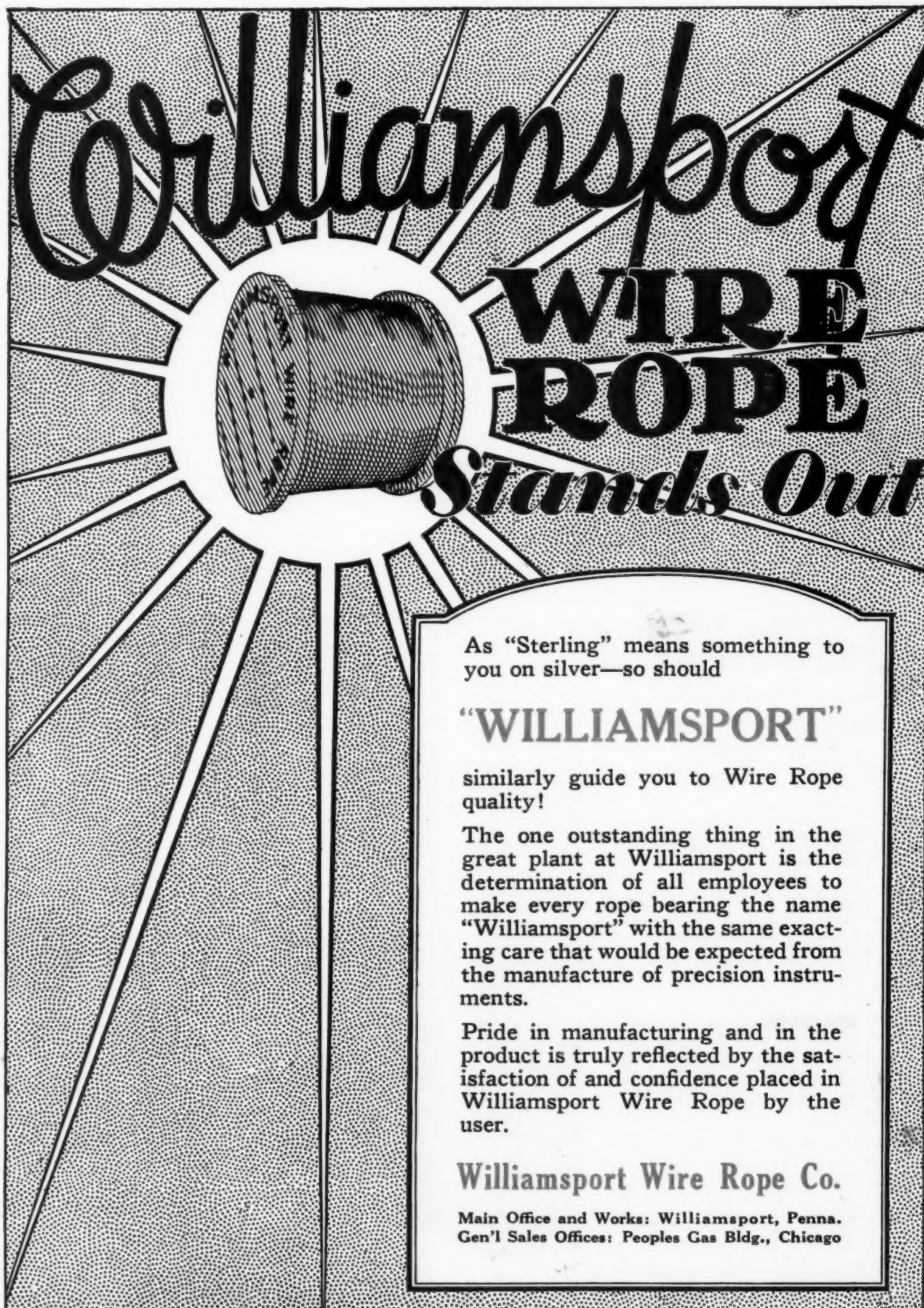
In the Electric OSGOOD digging efficiency reaches perfection! Undivided power for swinging, hoisting and crowding flows smoothly and quietly from a *single electric motor*. Single power source eliminates the use of three smaller motors, enabling the operator to concentrate the entire motive force on each single operation. Less machinery to care for—faster digging—more power for each operation—freedom from breakdown—simple to control. Wherever A.C. or D.C. current is available we recommend the Electric OSGOOD as the cheapest, fastest, most efficient digging tool in the world. The same clutch used on the Gasoline OSGOOD is used for disconnecting the electric motor from operating machinery. The motor starts under "no load" without drawing heavy line current. Write for more information on the Electric OSGOOD!



The Electric OSGOOD differs from OSGOOD gasoline driven machines in power plant and accessory equipment only. Current is taken in at the truck and to the upper body through distributor rings and self-adjusting brushes. Convenient fittings are provided on each end of the truck for electrical connection. Start-switch and safety cut-out switch are mounted on neat panel board. Overload and no-voltage relays give complete protection.

THE OSGOOD CO.
MARION OHIO

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Williamsport

WIRE ROPE

Stands Out

As "Sterling" means something to you on silver—so should

"WILLIAMSPORT"

similarly guide you to Wire Rope quality!

The one outstanding thing in the great plant at Williamsport is the determination of all employees to make every rope bearing the name "Williamsport" with the same exacting care that would be expected from the manufacture of precision instruments.

Pride in manufacturing and in the product is truly reflected by the satisfaction of and confidence placed in Williamsport Wire Rope by the user.

Williamsport Wire Rope Co.

Main Office and Works: Williamsport, Penna.
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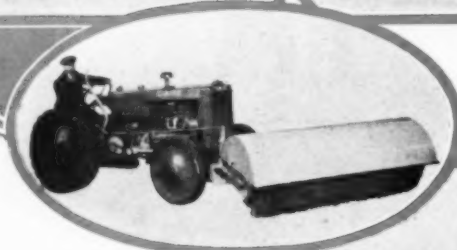
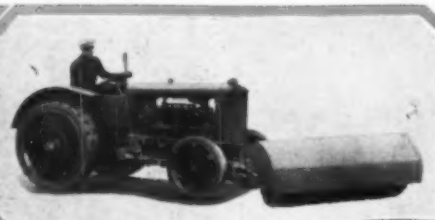
**Adopt This
Labor Saving
One Man
Outfit**

Detroit Street Sweeper and Snow Brush

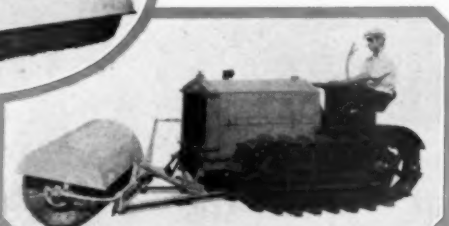
A product in ever-increasing demand for the economical removal of snow and dirt from city streets and alleys, or for sweeping municipal garages, airports and ice skating rinks. County and state officials find it advantageous because of its superior service, reliability and minimum upkeep.

The Detroit Street Sweeper and Snow Brush will sweep light snow and dirt at a speed up to 10 miles per hour making a clean path $5\frac{1}{2}$ feet wide. Also handles six to eight inches of snow with ease. When used with Ford truck a special water tank for laying dust in front of broom can be provided, or dump body for handling dirt.

Adaptable for use with Allis Chalmers Model U, Case I Industrial, Caterpillar 10 and 15, Cletrac "20", Fordson, Ford Truck, McCormick Deering 10-20, and others.



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gladly furnished
Address Dept. "B"



DETROIT HARVESTER COMPANY 5450 W. JEFFERSON AVE.
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Dig In and Win

If your work involves excavation you know what a fertile field for loss this branch is, unless it is carefully estimated and executed.

We want you to benefit by the recorded experience gained on many jobs, and published for you in this clearly printed reliable book. Your profits will reflect this opportunity to stack your experience alongside the combined experience of others in this line.

The coupon tells how you can secure "Earthwork and Its Cost" for free examination. Read it; then send it. Read the book; then decide whether you will keep it.

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This standard technical work by Halbert P. Gillette, is in its 3d Edition. It has 1346 pages. Pocket size, flexible, illustrated.

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Properties of Earth—Measurement, Classification and Cost Estimating—Boring and Sounding—Clearing and Grubbing—Loosening and Shoveling Earth—Spreading, and Rolling Earth—Hauling in Barrows, Carts, Wagons and Trucks—Methods and Costs with Elevating Graders and Wagon Loaders—Methods and Costs with Scraper and Graders—Methods and Costs with Cars—Methods and Costs with Steam and Electric Shovels—Methods and Costs with Grab Buckets and Dump Buckets—Methods and Costs with Cableways and Conveyors—Methods and Costs with Dragline Scrapers—Methods and Costs of Dredging—Methods and Costs of Trenching—Ditches and Canals—Hydraulic Excavation and Sluicing—Road and Railroad Embankments—Design and Construction of Earth Dams—Dikes and Levees—Slips and Slides.

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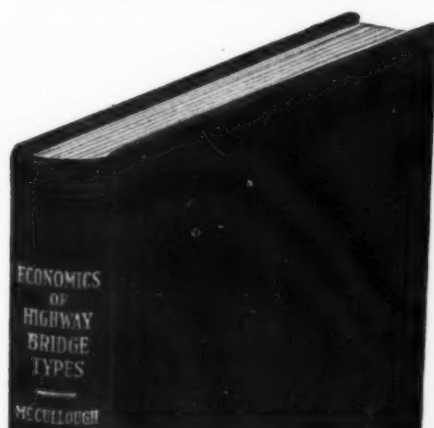
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R&S-12-30

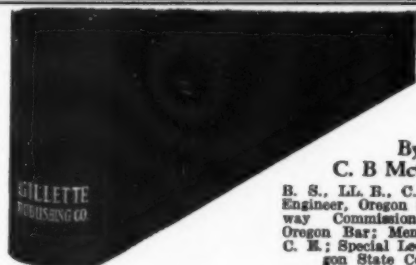
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"Economics of HIGHWAY BRIDGE TYPES"

Not how to build highway bridges, but how the road man can select the best type of bridge from the standpoint of economics. The author puts his finger directly on a fruitful possibility of loss and failure. An engineer is a better engineer for having read this book. *Examine it on free trial.*



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C. E.; Special Lecturer, Ore-
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R&S-12-30



Dietz Lanterns Stay Lighted



YOU need Dietz Red Lanterns — lanterns that can be left on road construction at night with confidence that they will be found burning in the morning — whatever the weather may be.



The ultimate difference in cost between a scientifically correct Dietz Lantern and something less reliable might be thousands of dollars in case of accident.

For economy and utmost safeguard use Dietz Red Lanterns for night warning duty.

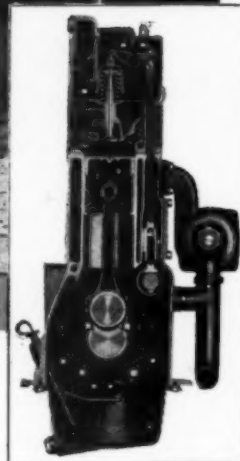
R. E. DIETZ COMPANY

NEW YORK

Largest Makers of Lanterns in the World

FOUNDED 1840





● One of a fleet of 2½ cubic yard dump trucks owned by Chas. Kaiser Company, powered by Continental 21R engines. Shovel powered by Continental 21R engine.

Cross section showing overhead valves with double springs and the rugged bridge truss nickel iron bearing caps held rigid to crankcase by four bolts instead of the conventional two. Center main bearing held by six bolts. Heads, bearings and crankshaft are interchangeable.

KEEPING AHEAD OF THE JOB

The trucks and shovels must keep ahead of the job or valuable loss of time is inevitable.

If the truck isn't there to receive its load the shovel must stop and men and machinery are idle. If the shovel fails the truck fleet is held up and all operations are stopped.

Continental heavy duty motors will consistently haul loads of 5 tons and more without interruption. Continental powered shovels can be depended on to keep the trucks busy.

The Continental "R" Series heavy duty motors are designed with interchangeable parts—perfectly machined and built of the finest material available. These motors provide a surplus of power and through the interchangeability of parts the contractor or fleet owner can keep all of his machinery on the job all of the time.

For an absolute guarantee of reliable performance and long usage—specify Continental.

CONTINENTAL MOTORS CORPORATION
INDUSTRIAL EQUIPMENT DIVISION
Office and Factory: Muskegon, Michigan
The Largest Exclusive Gasoline Motor Manufacturer in the World
See Our Exhibit at the Road Show, St. Louis



Continental Engines

When writing to advertisers please mention ROADS AND STREETS—Thank You.

BUILT to Make the Grade and Haul the Load



Take any job that calls on a locomotive for just a little more pulling power, a little more grade climbing ability and a little more flexibility of performance, and you'll find a Whitcomb Locomotive to do it. If a job presents new difficulties, there is, within easy distance, a Whitcomb expert to study the requirements and to recommend or design a Whitcomb Locomotive that will make the grade and haul the load.

Whitcomb branches, distributors and representatives are located in every corner of the globe. These men and organizations are equipped to supply the type and size of locomotive you need and to give an immediate and superlative degree of service whenever it is required.

Whitcomb Locomotives, from 2 tons to 100 tons, oil-electric, gasoline, storage battery and Diesel types are available. For detailed information write or wire direct to

GEO. D. WHITCOMB COMPANY

ROCHELLE

ILLINOIS

WHITCOMB LOCOMOTIVES

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"HEAVY TRAFFIC"
Pavement
at "LIGHT TRAFFIC"
Costs

*The new way to stretch
your paving dollars . . .*

Bit-u-muls

DURABLE rock pavements, with live, sticky asphalt to waterproof and bind them . . . Bitumuls construction now offers you "primary-road" quality at "secondary-road" prices.

Rock particles are interlocked as in hot penetration macadam, and thin coatings of asphalt are obtained as in closely controlled and more expensive hot plant mixed asphaltic concrete.

Yet, there are no heating costs whatever. And only simple equipment is required to construct Bitumuls. Application may be with the popular types of gravity or pressure distributors, or with ordinary pouring pots.

Longer Construction Season

Applied at any atmospheric temperature except freezing weather . . . and in damp, or even mildly rainy weather . . . Bitumuls non-skid paving also adds

many months to your construction season.

Voids are reduced to a minimum. And, because the use of excess asphalt is eliminated, there is no shoving and surface bleeding.

If you are interested in stretching your paving dollars . . . for secondary road construction, primary roads, city streets, subdivisions, widening, resurfacing, maintenance, and airports . . . investigate Bitumuls low-cost construction. It is backed by years of extensive research and widespread use throughout the world.

For "heavy traffic pavement at light

traffic costs" . . . be sure that your specifications measure up to Bitumuls.

Technical data, detailed facts, and specifications available in the Bitumuls Manual. Mail the coupon for a free copy.

Make this practical test

Order a sufficient number of barrels of Bitumuls to make a thorough test. Have your regular paving crews apply it...in small areas...with ordinary gravity or pressure distributors, or with pouring pots. See for yourself the amazing possibilities of Bitumuls in your pavement construction and maintenance ...its low cost...its durability...its non-skid surface.

AMERICAN BITUMULS COMPANY—Branches throughout the world
 Baltimore • Baton Rouge (La.) • Boston • Cincinnati • Los Angeles • San Francisco • St. Louis

Please mail me your free manual . . . without obligation

Name _____

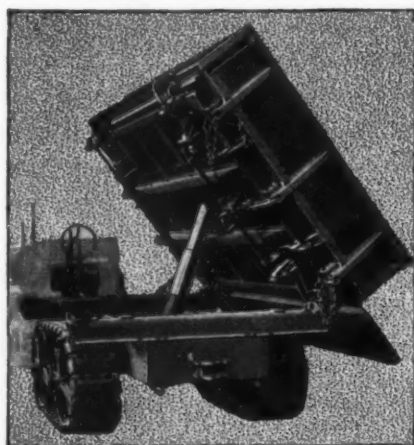
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why you should use ATHEYS

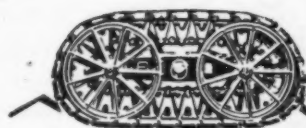
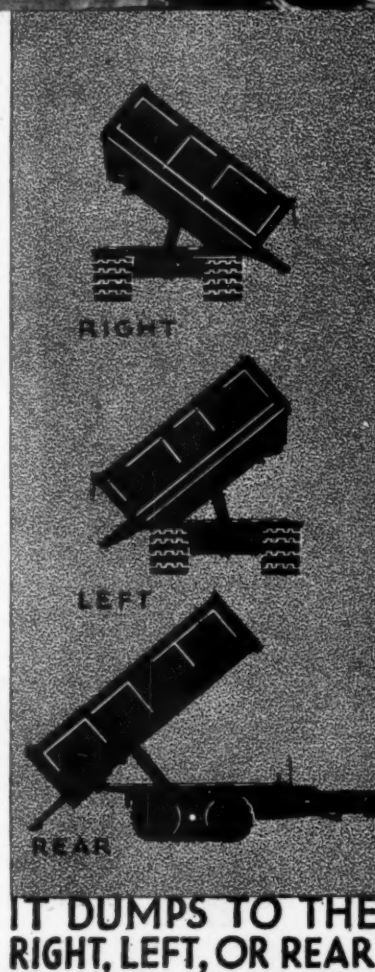


Put ATHEY Equipment to work for you and you'll find dozens of reasons why you should use ATHEYS. . . . You'll realize how carefully tremendous strength has been secured without excess weight; . . . —how their ability to dump to the right, left or rear—and their large capacities—speed up operations; . . . —how their light-running qualities allow the tractors to operate at top speeds and yet save materially on tractor operating and maintenance costs; . . . —how favorably their length of life compares with that of a tractor and how easily and inexpensively those parts subject to normal wear, can be replaced; . . . —how definitely ATHEYS are revolutionizing the dirt moving industry.



Over 50,000 ATHEY TRUSS WHEELS have seen service all over the world and under all operating conditions. ATHEY TRUSS WHEEL 3-way Dump Trailers offer YOU tremendous hauling economies and operating advantages. . . . It will pay you to write for complete ATHEY Facts. . . . Do it today.

ATHEY TRUSS WHEEL CO.
130 N. Wells St., Chicago, U. S. A.
Cable Address: "Trusswheel," Chicago
*The Baldwin Locomotive Works,
Foreign Representatives, Philadelphia, Pa.*



Athey

TRUSS WHEEL EQUIPMENT

Yes—we would like you to mention **ROADS AND STREETS.**

PIONEER GRAVEL EQUIPMENT

**MAKES DOLLARS
OUT OF
GRAVEL**

There is a Portable Pioneer Plant to fit your requirements. Write for detailed 80-page catalog showing different sizes and capacities of Portable Pioneer Screening, Crushing and Loading Plants, also Washing Plants, Draglines, Storage Bins, Shakers, Revolving Screens, etc.



No. 22B Pioneer Screening, Crushing, and Loading Plant and Pioneer No. 60 Dragline owned by Josephine County, Oregon and sold by the Portland Branch of L. A. Snow Company. Plant is operating near Grant's Pass, Oregon. Pit run material runs 90% to crush and plant is producing large daily capacities of one inch minus material.

Says J. G. Bromley, of Josephine County, Oregon, regarding experience with Josephine County Pioneer Plant pictured above: "The Pioneer Screening, Crushing and Loading Plant is truly a remarkable industrial unit for producing crushed materials at a low cost. As a complete portable unit it has no equal. This is a very mountainous section of the state and the plant is easily moved over any type of road, and placed on rugged bars.

All parts of the crusher are easily accessible and repairs are readily made. The plant simply needs good lubrication and the ordinary attention given any class of machinery. In five and one-half months this plant has been in constant operation. It has given no trouble and has proved itself a marvel of engineering triumph."

PIONEER GRAVEL EQUIPMENT MFG. CO.

1515 Central Avenue

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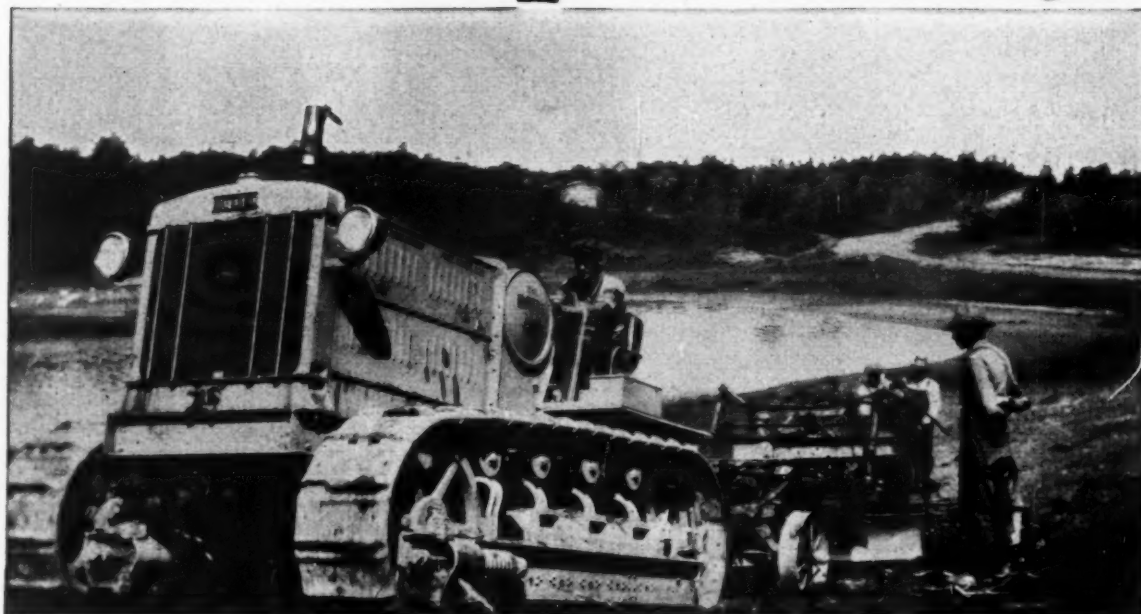
Minnesota

Distributors and Service Stations everywhere.

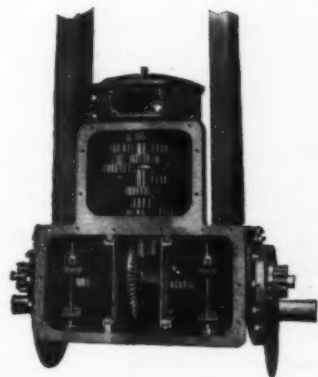
Write for name and address of one nearest you.

Yes—we would like you to mention **ROADS AND STREETS**.

Built-in Dependability!



with Large Size
Extra Strong
Transmission
Gears



The Bates Transmission assembly is built to withstand the unusual power demands of the large BATES "80" Tractor—large, wide face gears, case hardened by the special Foote Brothers heat treating process, giving very nearly double the strength of ordinary tractor gears.

Starting a New Road on Turtle Mountain with a . . .

BATES Steel Mule

The BATES "80" provides more Power and greater Traction for twelve and fourteen foot graders at less operating costs for men or fuel.

It pulls the largest size grader without apparent effort. Its ability to handle the work and its economy of operation will cut down your yardage costs of moving dirt to a minimum.

Before buying your new Tractor, let us show you and tell you about the many unusual features of the Models 35, 45, and 80 Tractors.

FOOTE BROS. GEAR & MACHINE CO.

111 N. CANAL ST.

CHICAGO, ILL.

Sales and Engineering Offices in All Principal Cities U.S.A. and Canada

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..WRITE..
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STANDARD PLANT HAS 6 UNITS

I
Steel Receiving
Hopper with Recip-
rocating Plate Feeder.

II
Steel Frame Feed
Conveyor with
2-wheel truck.

III
Complete crushing
and screening plant,
mounted on heavy
trucks with.....
(a) double-deck vi-
brating screen (b)
gyratory crusher (c)
elevator to return
crushed product to
screen (d) jib crane
(e) steel operator's
platform.

IV
Steel Conveyor for fine
finished product.*

V
Steel Conveyor for
coarse finished pro-
duct.*

VI
2-compartment, all-
steel storage bin for
loading trucks.*

*Not shown in illus-
tration.

The ONLY PORTABLE CRUSHING and SCREENING PLANT with a GYRATORY CRUSHER

Greater capacity, *not on paper but on the job* . . . finer crushing . . . more rugged construction . . . all are combined in the new TelSmith—the only portable crushing-screening-loading plant equipped with a gyratory crusher. It turns out two accurately sized products to conform exactly with state or county specifications for gravel or hard surface roads. The crusher is in closed circuit with the screen . . . *no oversize*.

The most outstandingly flexible portable outfit on the market . . . TelSmith may be equipped with a 6-A or 8-A TelSmith Primary Breaker, to deliver sand and minus 1½ in. rock . . . or with a No. 32 TelSmith Reduction Crusher, for sand and ¾ in. rock.

For quarry operations, adding either a 10-A TelSmith Primary Breaker or a TelSmith Jaw Crusher, at foot of feed conveyor, converts it into a two-crusher plant with a large capacity of ¾ in. or 1-in. product.

The capacity of TelSmith is truly remarkable. In clean sand and gravel . . . 30-40 tons per hr. making two products, sand separate from gravel . . . and 40-60 tons per hr. making one product, mixed sand and gravel. In crushed stone, 20-25 tons per hr.

All Steel . . . with the utmost rigidity of construction . . . *Timken Tapered Roller Bearings* throughout . . . all conveyors equipped with 3-pulley troughing idlers with anti-friction bearings . . . the TelSmith Portable is backed by TelSmith's Guarantee.

SMITH ENGINEERING WORKS, 82 Capitol Drive, Milwaukee, Wis.

1442 Builders Bldg.
Chicago, Illinois
Borchert-Ingersoll, Inc.,
St. Paul, Minn.

W. G. Kerr Co.,
Pittsburgh, Pa.
V. L. Phillips Co.,
Kansas City, Mo.

1367 East 6th St.,
Cleveland, Ohio
Choctaw C. & M. Co.,
Memphis, Tenn.

Knox Eng. & Eq. Co.,
Indianapolis, Ind.
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Dallas, Texas

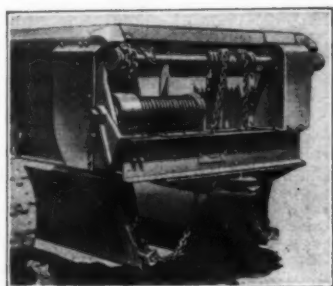
TELSMITH



The dump boss winding the doors of Western Crawler wagons equipped with spring wind-up. Notice that he trips the lever and the doors close all in one stride.

Finish Your Job Now

Carry On With Western Crawler Dump Wagons



The simple mechanism of the Western Spring Wind-up is mounted entirely on the wagon. No special connections are required on the tractor.

Winter means nothing to Western Crawler Dump Wagons pulled by crawler tractors. They can operate under poor as well as good haulage conditions. Use them to lengthen your season. You can finish your job yet and get your profit.

If you order your Western Crawler Wagons equipped with the Western Spring Wind-up you can lower your costs still farther. This sturdy, fool-proof device permits the doors of the wagon to be opened and closed by the tractor driver or the dump boss. The action is almost instantaneous. The mechanism is thoroughly reliable.

Order Western Crawler wagons equipped with the Western Spring Wind-up now and **CARRY ON**. If you are unfamiliar with the wagon or the spring wind-up attachment, write at once for Bulletins 30-JQ and 29-QQ.

Western Wheeled Scraper Company

Dump Cars and Grading Equipment

Aurora, Illinois, U. S. A.

WESTERN

Yes—we would like you to mention **ROADS AND STREETS**.

YEAR 'ROUND...TOUGH GOING



You'll find **FWD Trucks** giving unmatched service

"Regard of service . . . the FWD is the greatest single power unit". This comes to us from the field. It comes from men who use them year after year. State and county highway officials tell us the same. They know FWD power and traction . . . its all year service.

In short . . . because the FWD drives and brakes on all four wheels and distributes the load and power to each of the four wheels

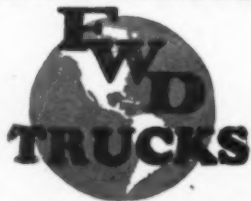
. . . it is unmatched for pulling and hauling.

Twenty years of sound engineering and manufacturing based on close observation of FWD Trucks in the field reflect their benefits in the present line of FWD Trucks. There's no service too severe for the FWD. Tell us the nature of your work . . . let us master it with an FWD. Write for specific literature.

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis.

Canadian Factory

Kitchener, Ontario



BACKED BY

NATION - WIDE SERVICE

Drives through front and rear wheels, brakes on all four wheels.

Steers as easily as a pleasure car.

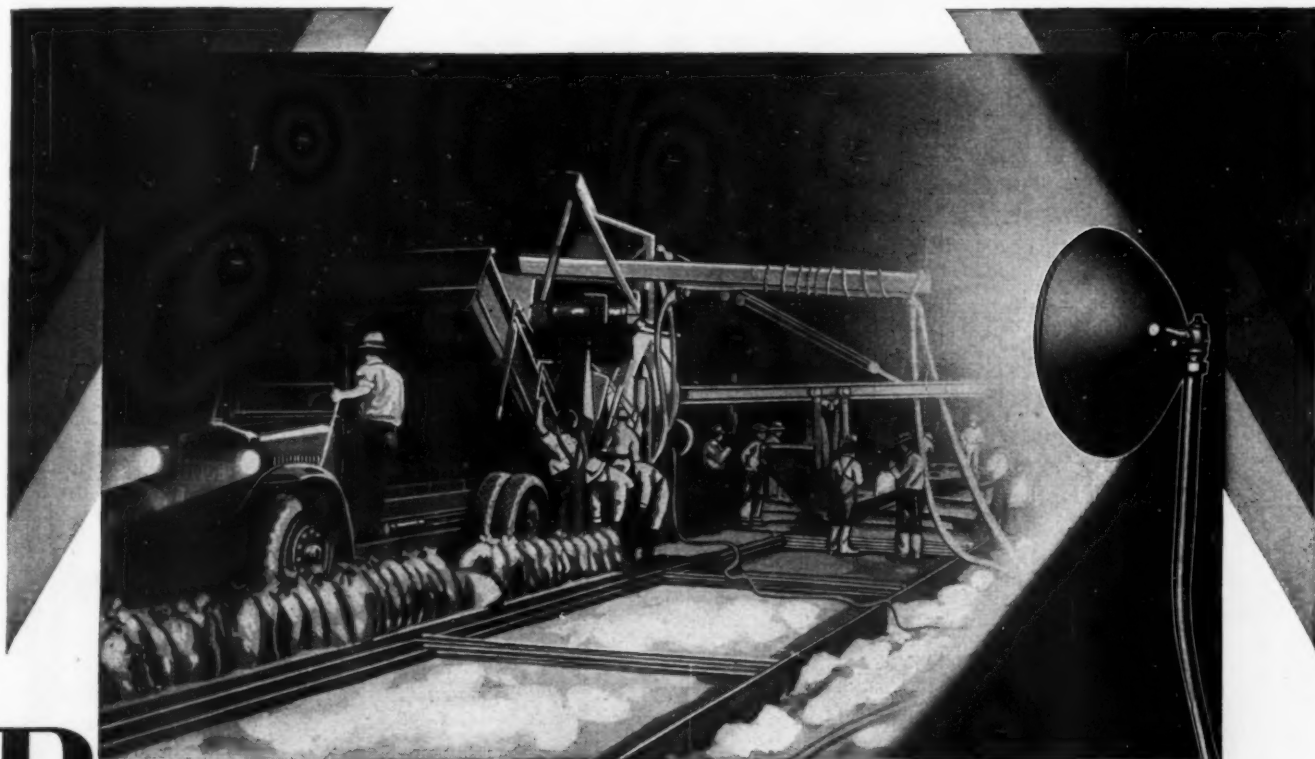
A general service truck which adapts itself to special needs and provides more than economical transportation.

Furnished in 2 to 10 ton sizes, including four wheel, six wheel and tractor trucks.

Manufactured by the oldest and largest manufacturer of four wheel drive trucks in the world.

Have increased in sales 1084% in the past eight years.

Received 62% of 1929 orders from owners of FWD Trucks.



PRESSED FOR TIME?

When you lose valuable time because of breakdowns, adverse weather conditions, or other emergencies—

Put Carbic Flood Lights to work!

Bring your work up to schedule—and keep it there. Any time is working time for the contractor equipped with Carbic Flood Lights.


Carbic Flood Lights afford ideal illumination for night work. Their powerful rays enable your men to work rapidly and safely at night. There is no glare, and no dark shadow. Penetrates fog, smoke or dust to a remarkable degree.

The initial cost of the Carbic Flood Lights is low, and the operating expense is negligible.

Carbic is distributed by the Union Carbide Sales Company through its national chain of warehouses and is sold by jobbers everywhere.



OXWELD ACETYLENE COMPANY

Unit of Union Carbide  and Carbon Corporation
NEW YORK

Sales offices in principal cities

Technical Publicity Dept., 12th floor
205 East 42nd Street, New York, N. Y. BAS-12-30
Without obligation, I would like to have additional information on Carbic Lights.

Name.....

Street Address.....

City.....State.....

ERIE

AggreMeters

O-K!

*Check
and
Double Check*



Type GA Three Compartment
Weighing AggreMeter Plant

The efficiency of this product has been proven by its use on many road jobs in almost every State in the Union. Its use effects big economies in time and labor. Therefore, it is a profitable investment that will pay steady returns day after day.

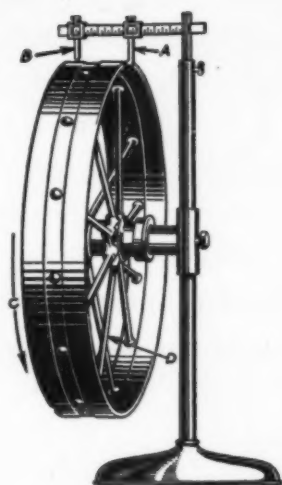
This plant embodies all the features and refinements found necessary for speedy operation and correct weighing of the aggregates. The AggreMeter has been designed for greater simplicity—not how many parts, but how few. As a result it is practically trouble-proof.

You will find Erie AggreMeter plants on the big jobs where time means money and only the best of equipment is used. Ask anyone who owns an Erie and he will tell you practically the same story—"The sturdiest plant built—the fastest in operation and the most accurate." That is the sum and substance of the whole story, and we know that our customers are satisfied because so many of them are ordering additional units.

You will find our catalog interesting and helpful. A copy of it can be secured by just writing to

ERIE STEEL CONSTRUCTION CO.
613 Geist Road **ERIE, PENNA.**

You Can't overload them



French & Hecht Wheels are
tested for ...
**ROUNDNESS ... TRUENESS
and BALANCE.**

WHEN it comes to extreme loads and operating conditions it is always safe to rely on French & Hecht Wheels. In addition to their inherent structural advantages they are engineered to meet all wheel requirements. That's why nearly 800 manufacturers of wheeled equipment of all kinds use French & Hecht Wheels.

The Hughes-Keenan "Iron Mule" is equipped with French & Hecht Wheels because they stand up indefinitely under any kind of loading and are designed to provide maximum traction under all conditions.

French & Hecht, Inc., Davenport, Iowa
—Springfield, Ohio—Wheel Builders
since 1888.



FRENCH & HECHT

STEEL WHEELS

PUT YOUR CATALOG DATA IN DAILY CIRCULATION

An advertising man of national reputation has said that "market is a state of mind." Create a desire for your product and you have a state of mind which makes your market.

Road and street contractors, highway engineers and public officials turn to the ROAD AND STREET CATALOG AND DATA BOOK to satisfy their desire for new equipment and materials just as naturally as they turn to the dictionary when in search of a word.

Comments from users and reports of purchases indicate that this Catalog is given preference over individual manufacturers' catalogs. We present a few comments.

"Practically all of our supplies and equipment for our present job were bought from the Data Book."

"For handy and quick reference buying we find the Road and Street Catalog and Data Book mighty useful."

"Probably one of the most important books on our shelf is the Road and Street Catalog and Data Book, which we find very useful in buying and identifying highway equipment and supplies."

"We find your Road and Street Catalog and Data Book very useful not only in looking up equipment but in checking engineering details of estimates. If all of the leading manufacturers would put comprehensive data in one catalog it would be very useful, as individual catalogs are frequently thrown away when there is no immediate use for them."

A few reported purchases from 1930 Book:

\$17,930.00 By San Angelo, Texas firm
From 5 advertisers

\$10,335.00 By Atlanta, Ga., firm
From 8 advertisers

\$32,050.00 By Marshalltown, Iowa, firm
From 5 advertisers

\$14,500.00 By McMinnville, Tenn., firm
From 5 advertisers

\$12,000.00 By Lawrenceburg, Tenn., firm
From 2 advertisers

\$ 2,550.00 By Wheatland, Wyo., firm
From 3 advertisers

23 different manufacturers represented in above list.

1930 Was
a Great Highway Year



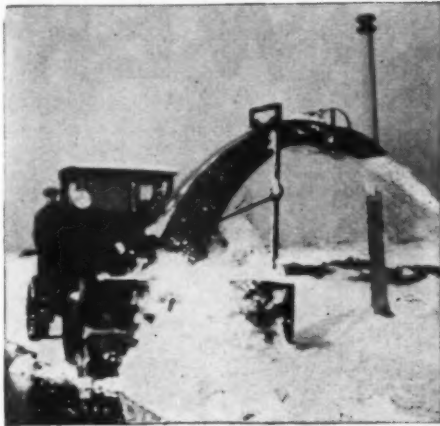
1931 Will
Be a Greater Year

7th Annual Edition of the Catalog goes to press the 1st of February. It is distributed to a picked list of contractors, engineers and public officials.

You secure year-round Catalog service at less than cost of printing and mailing one piece of direct mail. Ask for specimen layout and particulars. No obligation on your part.

Gillette Publishing Company

221 East 20th Street, Chicago, Ill.



WET SNOW

WILL YOUR EQUIPMENT HANDLE IT ?



SNOGO

SNOGO is guaranteed to handle wet snow of any consistency • • • It's record to date is snow containing over 50% moisture • • • in fresh light snow or water-soaked slush its capacity remains the same and is measured in tons per hour.

THE SNOGO CATALOG TELLS
THE COMPLETE STORY—WRITE FOR A COPY

KLAUER MFG. CO. DUBUQUE, IOWA

Please mention ROADS AND STREETS—it helps.

CRAWLER POWER



For Every Industrial Use

A VERY different crawler tractor — Model GH Trackson McCormick-Deering • Designed to operate efficiently with every kind of equipment from scrapers to front-end shovels • Fine balance and great structural strength assure quick and continuous operation under the heavy super-imposed loads and abnormal stresses of bulldozers, hoists, power graders, diggers and loaders • Wide-spaced crawlers and a low center of gravity provide the balance • Extra heavy main frames, axles, truck wheels and bearings provide the strength • Wide clearance between the crawlers and motor permits easy and secure attachment of equipment and makes all external parts readily accessible • The track shoes are of heavy electric steel, specially corrugated to grip securely, and cast in *one piece* • Operation is easy and natural with handy controls and improved hand-wheel steering • The wide usefulness of this crawler-tractor will strike home with every contractor, road builder and industrial user who is going after business and results in 1931 armed with power equipment that will handle efficiently the greatest number of different jobs • Write for bulletin No. 252 . . . TRACKSON COMPANY, 1324 S. First Street, MILWAUKEE, WIS.

CRAWLER **TRACKSON** **TRACTORS**
MCCORMICK-DEERING

When writing to advertisers please mention **ROADS AND STREETS**—Thank You.

It's Here!



The New 1¹/₄ Yard GAS + AIR

The Gas + Air principle — proved so successful in the famous Gas + Air 1-yard shovel—is now available in a bigger, faster, more powerful, thoroughly improved and tested shovel—the new GA-3.

A full 1¹/₄-yard manganese dipper—bigger compressor and air crowd and swing engines—heavier and stronger caterpillar truck — complete, easy steering from operator's seat, at any cab position—easier front end change — many other improvements that insure fullest advantage of Gas + Air's steamerlike power.

And don't forget this: The Gas + Air stores crowding power while swinging, dumping and dropping the dipper. *It is the only gas shovel that can crowd like a steamer and hoist at the same time with all the power of the motor.*

Send today for the much discussed booklet "How About This Gas + Air?"

BUCYRUS-ERIE COMPANY, manufacturers of the only complete line—all sizes, types and powers. *Plants:* So. Milwaukee, Wis.; Erie, Pa.; Evansville, Ind. *General Offices:* So. Milwaukee, Wis.

Representatives throughout the U. S. A. Offices or distributors in all principal countries. *Branch Offices:* Boston, New York, Philadelphia, Atlanta, Birmingham, Pittsburgh, Buffalo, Detroit, Chicago, St. Louis, Dallas, San Francisco.

A-100-12-30-RS

**BUCYRUS
ERIE**

BUCYRUS-ERIE COMPANY
South Milwaukee, Wis.

Please send me the booklet "How About This Gas + Air?"

Name _____ Position _____
Company _____ Address _____
City _____ State _____

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Shovel Dragline Crane

A COMPLETE range of shovel, dragline and crane equipment is ready to go with the Marion $1\frac{1}{4}$ yd. Gas-Electric — the new-type excavator that operates without clutches.

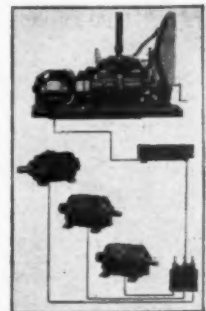
▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼
**A SIZE FOR EVERY
NEED**

Type 450
 $1\frac{1}{4}$ yd. Steam, Electric,
Gas-electric, Diesel-electric.
Type 32 - $1\frac{1}{2}$ yd. Steam.
Type 460
 $1\frac{1}{2}$ yd. Electric, Gas-Electric.
Type 480-2 yd. Steam, Electric.
Type 490- $2\frac{1}{4}$ yd. Electric.
Type 4120-3 yd. Electric.
Type 5120-3 yd. Electric.
Type 4160-4 yd. Electric.
Type 125-4 yd. Steam, Electric.
Type 5320
8 yd. Steam, Electric.
Type 5480 - 12 yd. Electric.



Hundreds of these speedy, rugged machine are already in the field, out-digging and out-wearing clutch-type shovels in an amazing man-

ner. In fact 50% of Gas-Electric owners operate *two or more* of this remarkable excavator. It is the only Gas-Electric in the field — Marion's exclusive contribution to the excavating industries. Type 450 will do *your* work. Write us about your own situation and the kind of equipment you need. Get the facts first hand without obligating yourself in any way.



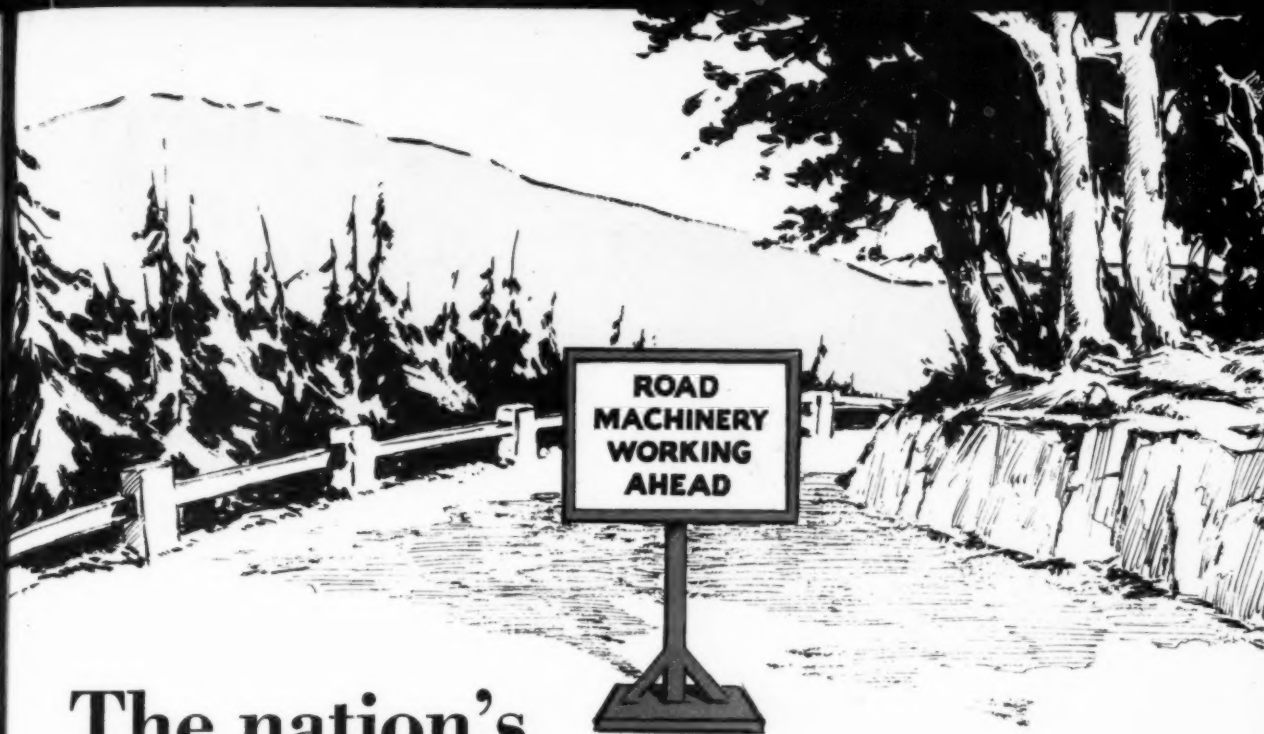
Power is transmitted to three independent motors — no clutches to work and wear — and the engine can't be stalled.

Come to Shovel  Headquarters

THE MARION STEAM SHOVEL COMPANY

DISTRICT OFFICES — NEW YORK — CHICAGO — PHILADELPHIA — BIRMINGHAM
KANSAS CITY — SEATTLE — SAN FRANCISCO

MARION, OHIO, U. S. A.



The nation's highways are our laboratories!

MANY a contractor, many civil officials, many an engineer faces the present gigantic task imposed by the greatest road improvement program in all history, with the assurance that efficient tools are available—competent for the project.

In the field of roadworking equipment, too, has taken place the substitution of machines for hands—and then the competition of machine against machine in the battle to lower road improvement costs.

In 1858 the first Austin road scraper went to work on American highways. Little more than a graded lane sufficed for the animal-drawn traffic of that day and that of later years. Yet, even then were

learned lessons in roadworking methods and design of equipment which enabled Austin-Western to meet the new era of high speed motor travel and place in the hands of modern trailmakers machinery adequate to the new demands.

Thus, for 71 years Austin-Western have perfected their products on the nation's highways. Austin-Western improvements in equipment have been not only *salable* but *usable*—because above all else, they have been *practical*. In their factories, Austin-Western Engineers are building equipment based upon the lessons of the road. Austin-Western never intends to lose the *practical* touch in pursuit of theoretical perfection.



Austin-Western ROAD MACHINERY

AUSTIN-WESTERN ROAD MACHINERY—COAST TO COAST



Now roads may be kept open the year 'round... *Economically!*



Austin Dual Drives are
powerful fighters on any
snow removal job.

Snow removal attachments for Dual Drive Motor Grader

Snow-bound drift-laden roads, halting traffic and hindering business, can be avoided if proper equipment is used. It is no longer necessary to endure such inconveniences.

Austin-Western equipment has solved the most difficult of snow removal problems in parts of the country where winter "tie-ups" have been exceptionally severe.

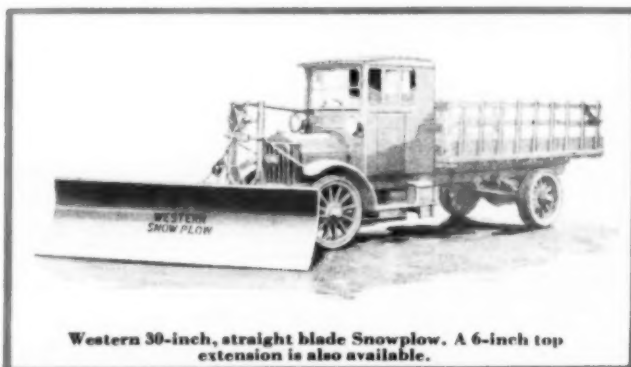
The 10-20 Austin Dual Drive Motor Grader, pictured above, is equipped with a special snow blade and "V" shaped snowplow, and is effective both for ordinary snow removal and for bucking heavy drifts. Using this machine the year around reduces your capital investment in road maintenance equipment. The same extra margin of power and traction that puts the Dual Drive 'way out ahead in the motor grader field, makes them powerful fighters in any snow removal job.

Your present Dual Drive Motor Grader is easily equipped with snow removal attachments. If you consider purchasing snow removal equipment, a Dual Drive would be an economy because you would get year 'round utility, instead of having money tied up in idle equipment eight or nine months of the year.

Western Convertible Snowplows

Western Snowplow attachments for motor trucks are remarkably effective. Furthermore, they are inexpensive enough to be within the financial reach of the smallest communities, both because of their cost and the complete range of service afforded by their convertibility feature. Either of two blades—straight for ordinary use or "V" shaped for heavy drifts—attach to a frame mounted on the front of a motor truck. Many miles of roadway can be cleared of snow as fast as it falls with this equipment.

Let A-W solve your snow removal question. Write for complete information—now.



Western 30-inch, straight blade Snowplow. A 6-inch top extension is also available.

THE AUSTIN-WESTERN ROAD MACHINERY CO.

400 North Michigan Avenue • CHICAGO, ILLINOIS • Branches in principal cities

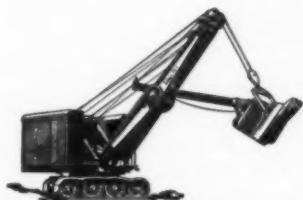
Leaning Wheel Graders, Straight Wheel Graders, Motor Graders, Elevating Graders, Crawler Dump Wagons, Scarifiers, Rock Crushers, Portable Conveyors, Rollers, Motor Sweepers, Street Sweepers, Sprinklers, Road Oilers, Hot Patch Portable Asphalt Plants, Plows and Scrapers.

AUSTIN-WESTERN ROAD MACHINERY—COAST TO COAST



T

HE tremendous power which propels a Lorain Center Drive Shovel with all its tons of steel at 1½ miles an hour, can be concentrated directly to the crowd motion when the machine is digging.



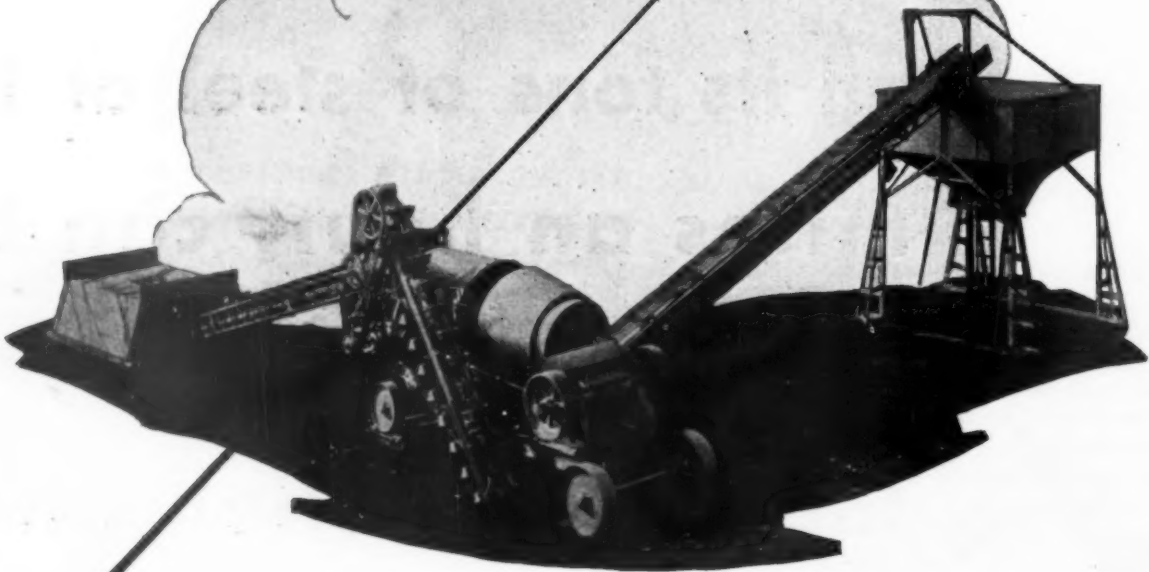
THE THEW SHOVEL COMPANY • LORAIN, OHIO

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CRUSHERS·BINS·SCREENS·CONVEYORS
WASHING PLANTS·ONE PIECE OUTFITS·TRUCKS
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MAKE
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"Performance Is What Counts"

TANDEM PLANTS·FIELD CONVEYORS·SAND SCREENING ATTACHMENTS
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ROAD MATERIAL HANDLING EQUIPMENT

Made by
Iowa Manufacturing Company
Cedar Rapids, Iowa

Many Miles of CHICAGO BOULEVARDS Surfaced with STANOLIND CUT BACK ASPHALT



Showing first application of Stanolind Cut Back Asphalt on roadway to be surfaced.



Mixing mineral aggregate and Cut Back Asphalt on the roadway.



Rolling after completely mixing and surfacing on the roadway.



Completed Roadway.

THE BOULEVARDS in the Park Systems of Chicago are the heaviest traveled in the world, carrying passenger cars and double-decked buses.

The section of pavement shown here is being surfaced with Stanolind Cut Back Asphalt. This method of maintaining paving and building up the thickness is being used to a greater extent each year. It is not an experiment, but a practical solution of maintenance problems, and has been giving satisfactory service for over five years.

The services of the Standard Oil Company engineers are available to those who wish further details on this type of construction.

STANDARD OIL CO. (Indiana)
910 S. Michigan Avenue Chicago, Illinois

712

ASPHALTS FOR EVERY PURPOSE

If You Compete for— YOUR SHARE of the Millions Spent for Roads



Here is a Glimpse of the Contents:

Highway Location and Surveying
By W. W. Crosby, R.C.E., C.E.
D.Sc., D.Eng., F.A.S., F.R.S.A., Mem-
ber A.S.C.E., etc.,
and George B. Godwin, Member
A.S.C.E., A.A.E.

Book I—Notes on Highway Location.
Book II—Notes on Mountain High-
way Location.

Book III—Notes on Highway Survey-
ing.
Traffic Actualities and Possibilities
—Speeds and Safety—Signs—Align-
ment—Grades—Widths—Recrea-
tional Use of Highways Affecting
Their Location—By-Passes—Economi-
cs and Formulae—Location Proce-
dure.

Labor Costs of Construction

By Frank L. Connor

Earth Excavation and Transporta-
tion—Rock Excavation—Sheet Piling
and Cofferdams—Wood and Concrete
Piles—Concrete Costs—Concrete Form
Costs—Steel Reinforcing—Structural
Steel—Timber Work—Rough and Fin-
ished Carpenter Work—Brick and Tile
—Masonry—Plastering and Plumbing
—Painting—Sewers—Water Works—
Concrete and Other Paving Costs—
Equipment and General Labor Ex-
pense.

Economics of Highway Bridge Types
By C. B. McCullough, B.S., L.L.B.,
C.E., Bridge Engineer, Oregon State
Highway Commission; Member Oregon
Bar; Member A.S.C.E.; Special Lec-
turer Oregon State College.

General Factors Controlling Types
Selection—Fundamentals of Economic
Analysis—Bridge Types—General Dis-
cussion and First Cost Data—Short
Span Superstructures—Substructure
Types—Miscellaneous Types and Cost
Data—Renewal and Maintenance
Costs—Unit Costs—Illustrative Prob-
lems in Type Selection.

Handbook of Construction Cost
By Halbert P. Gillette

Engineering Economics—Prices and
Wages—Hauling—Excavation Econ-
omics—Concrete Construction—Dams,
Reservoirs and Standpipes—Water
Works—Water Treatment Plants—
Irrigation—Land Drainage—Sewer-
age Treatment—Garbage Dis-
posal—Street Sprinkling, Cleaning and
Snow Removal—Roads and Pavements
—Highway Bridges and Culverts—
Railway Bridges—Steam Railways—
Small Tunnels—Large Tunnels—Bank
and Shore Protection—Docks and
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What a battle! For such a prize! It is challenging to realize that only a fraction of 1% of the nation's annual road bill, if paid to you would mean wealth the rest of your life.

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The Road Builder's Library summarizes the experience of successful engineers and road workers right up through 1929. It will give you a boost upward in the percentages.

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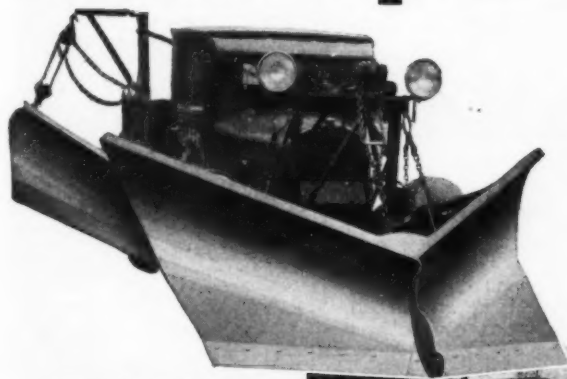
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Insure Open Roads All Winter



with **FRINK**
SNO-PLOWS

FRINK FEATURES

Plow will not wedge or buckle in high drifts. Higher speed. Pushes one-third easier.

Inside control. Quickly attached to any standard truck.

Readily adjustable to scrape road clean or leave several inches of snow as conditions demand.

Easily detached. Does not interfere with use of truck for other purposes.

No side thrust even when using only one side of plow.

Lifts clear for driving from one job to another.

Bevels the banks.



Insure open highways and uninterrupted traffic by writing **TODAY** for Sno-Plow Catalog No. 10

Frink Sno-Plows on your trucks are positive insurance against snow blocked highways and traffic interruptions. Their scientific design enables them to speed through the deepest drifts without buckling or wedging—20 to 35 miles per hour.

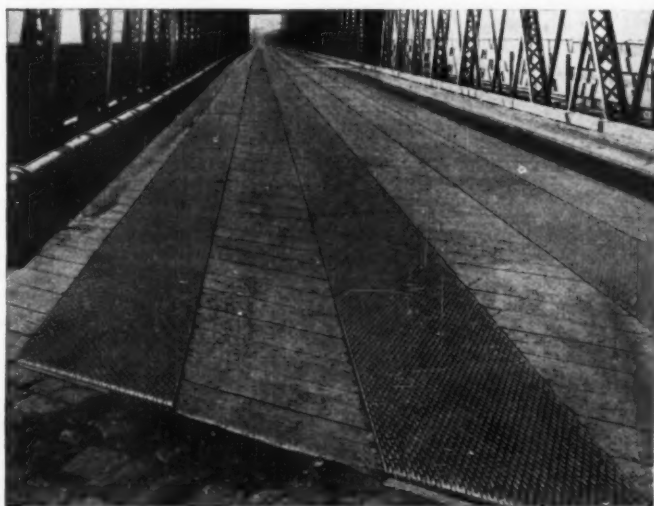
Frinks operate with equal efficiency on all road surfaces. Cutting edge is quickly adjustable to fit road contour.

Leveling Wings trim off the banks and spread the snow to eliminate the formation of drifts.

These fast, sturdy snow fighters are readily adaptable to your present truck equipment and can be easily detached to free trucks for other duties.

Davenport Locomotive & Manufacturing Corp.
Davenport, Iowa

Licensed Manufacturers of Frink Sno-Plows for Illinois, Wisconsin and States West of the Mississippi

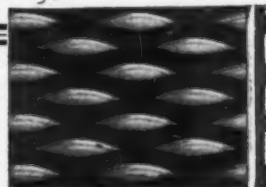


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"A.W." Diamond Pattern Rolled Steel Traffic Treads provide a steel armoring that protects wooden floors of bridges. Planking lasts longer, maintenance work is minimized and the loads are distributed preventing premature wear and breakage between supports.

Laid over lines of wheel travel, "A.W." Traffic Treads absorb the shock and abuse of traffic.

May we explain how simple and inexpensive it is to install "A.W." Traffic Treads on every wooden floor bridge? Write us.



"A.W." Diamond
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"A.W." PRODUCTS

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- *"A.W." Floor Plates
- *"A.W." Traffic Treads
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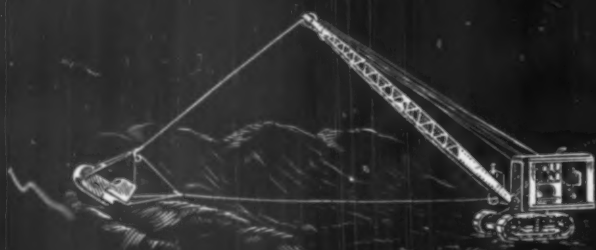
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of Gravity=High Stability

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— the ONLY safety
light with the low-cost,
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Unbreakable
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Save with Steel

Manufacturers of The Toledo Horse—the ideal highway barricade

What Will the Profit Be?



Methods and Costs

Determine this old question that lies in the background of the contractor's or engineer's mind during every job. Accurate costs and proved methods for a special class of work are plainly presented in

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Handbook of ROCK EXCAVATION

Drilling and handling rock of all kinds under all conditions are covered in the 825 pages of this standard book. It will show you dozens of ways to cut corners. Contains economical methods of blasting, loading and transportation of stone. Covers the whole subject from open-cut excavation and quarrying dimension stone to sub-aqueous rock excavation. Its tables will save you time. Facts will save guesswork. And you can examine it before you buy.

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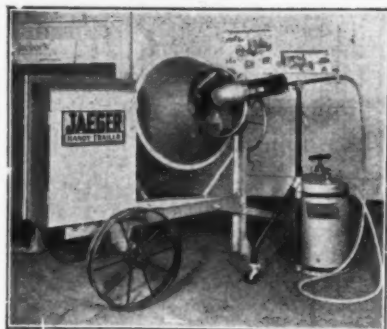
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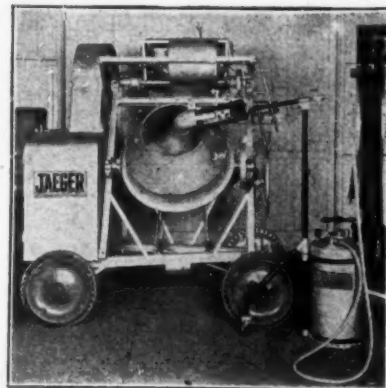
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CONCRETE HEATERS



Designed to operate with all sizes and makes of concrete mixers—either tilting or nontilting.



All Mohawk torches have the exclusive removable coil and non-clogging vaporizing tip features.

HAND TORCHES—WATERHEATERS—SALAMANDERS

MOHAWK ASPHALT HEATER CO.
SCHENECTADY, NEW YORK

You Wouldn't Buy a Grader for This—



But, if you have a WARCO you can do it very well, indeed. For heavier snows a WARCO V-Type Snow Plow, that is controlled from the operator's station, can be mounted in front. WARCO Steel or Rubber Crawlers help a lot, too.



Let us tell you more about these year around Road Building and Maintaining Machines.

W. A. Riddell Company, Bucyrus, Ohio

Power & Drawn Graders--Wheeled Scoops--Rear Type Crawlers for Tractors

Yes—we would like you to mention **ROADS AND STREETS.**

there must be a reason . . .

why 25 State Highway Departments use
"GOOD ROADS" SNOW PLOWS for trucks...



why nine of these Highway Departments placed orders totalling 325 "Good Roads" Plows within a five weeks period this fall . . .

why they go by the hundreds to City, Town and County departments, Villages, Industrials, Trucking and Bus companies, Public Utilities, Parks, Airports, Clubs, Colleges and Schools, Farms and Estates, Cemeteries and many other private and public owners.

"SNOW PLOW HEADQUARTERS"

Builders of Reversible Blade and "V" Type Snow Plows for quick attachment to any standard make Motor Truck or Bus from one ton to the heaviest built.

"There's a 'Good Roads' Plow to meet any snow removal condition."



THE GOOD ROADS MACHINERY COMPANY, INC.
PHILADELPHIA NEW YORK WATERTOWN, MASS. **KENNETT SQUARE, PA.** PITTSBURGH CHICAGO HARRISBURG, PA.



The "STOLLE JUNIOR" SPREADS ROAD MATERIAL FROM ANY DUMP TRUCK

Save all the costly labor of hand spreading, also the attendant waste of material, by spreading directly from the trucks with which you haul the material to the job. In addition, the "STOLLE JUNIOR" will do better work for you and more of it without a murmur.

Write for complete bulletins.

STOLLE ROAD EQUIPMENT COMPANY
3010 LaSalle St., St. Louis, Mo.

BIG RED SNOW FENCE

A REVOLUTIONARY DEVELOPMENT IN SNOW FENCE

Manufactured by

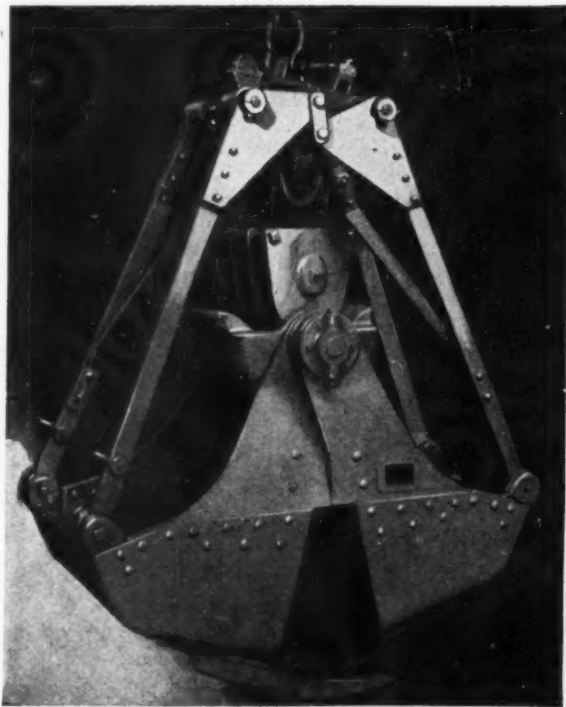
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Address communications to Joliet, Illinois, office.



Getting the jump *every time*



A LANKY basketball center towers over the opponent he faces. With a greater reach, he gets the jump every time. A Hayward Class "K" Clam Shell Bucket helps the

contractor to get the jump on every job he faces. It is speedy in operation. Heavily proportioned, it provides the closing power for natural excavation and other hard digging assignments.

Having four different types of digging and rehandling buckets to draw from, makes a Hayward recommendation absolutely unbiased.

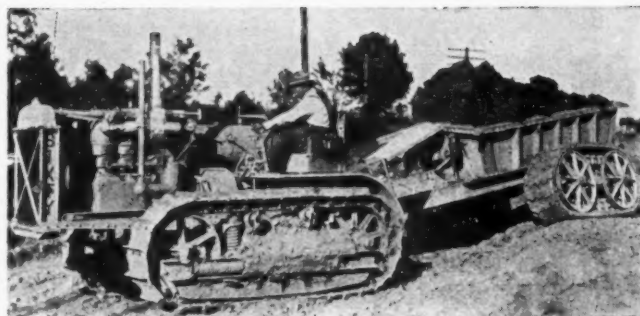
THE HAYWARD COMPANY
38-50 Church St., New York, N. Y.

Builders of Clam
Shell, Orange Peel,
Drag Line and Elec-
tric Motor Buckets;
Dredging, Excavat-

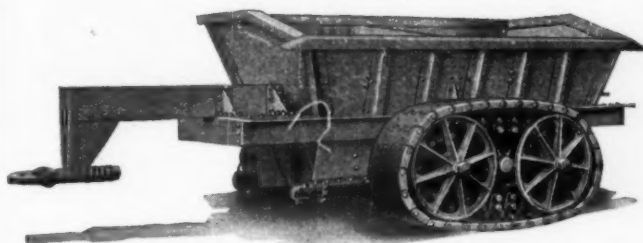


ing and Coal Han-
dling Machinery;
Automatic Take-up
Reels; Counter-
weight Drums.

Hayward Buckets



Dreadnaught Crawler Wagon

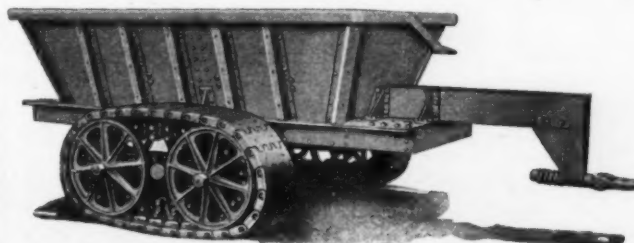


A good crawler wagon must run light, must carry heavy overloads, must withstand extraordinary abuse, and above all must keep running day after day under the most severe conditions. The Dreadnaught Wagon is built to do all of these things and is backed by a company forty years old with ten years experience in the manufacture of all classes of crawler wheel equipment. (See It at the Road Show).

Write for Bulletin

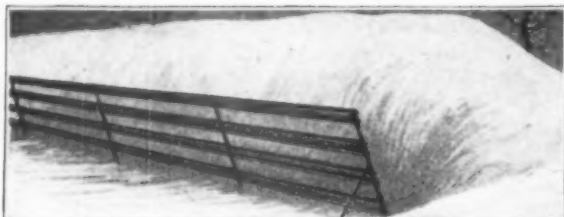
Crawler Wheel Division

Electric Wheel Company, Quincy, Ill.



Please mention ROADS AND STREETS—it helps.

Sand Control



Are there any roads anywhere in your state that need it?

If so—we would like to know the names and addresses of the State or County Officials who have this problem so that we may get in touch with and help them.

BLIZZARD BUSTER All Steel Snow Fence will solve their problem for them. It is the only snow fence yet discovered that will control drifting sand or dirt in a satisfactory manner.

It stays clear of the sand drift itself and will stop the dirt from piling up on the road. It is the only fence that will not become buried in the sand. It stays clear and it does stop the sand.

Two years ago the U. S. Government ordered 1,500 feet to keep the sand off the road leading out to the Veteran's Hospital at Fort McKenzie, near Sheridan, Wyoming. They liked it so well that early this spring they ordered 1,500 feet more.

Repeat orders are proof of efficiency.

A trial will eliminate your drifting sand trouble.

Yours for a trial order,

Just address **NICO-494**

Northfield Iron Co., Northfield, Minn., U. S. A.

For City or Airport use "Blizzard Buster" has no equal. Painted Highway yellow for Airports at reasonable extra cost.



DUMPING EQUIPMENT to fit *YOUR* needs

Back of every Wood dumping unit is 19 years' practical experience.

The complete Wood line includes:

Hoists and W Type dump bodies for chassis of 3 ton and up;

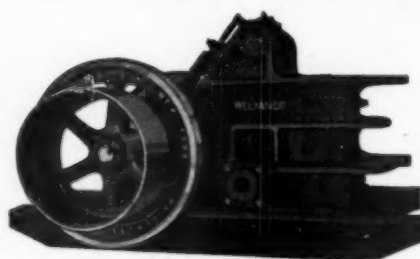
Hoists and L Type dump bodies for 1½ to 3 ton chassis;

Hoists and C Type dump bodies for 1 and 1½ ton chassis.

Wood national service is at your elbow in principal cities of the United States and throughout the world. An organization of service for dump truck men.

WOOD HYDRAULIC HOIST & BODY CO.
DETROIT U. S. A.

There Is A Difference



Any Crusher will operate satisfactorily for a time, but

RELIANCE CRUSHERS and Handling Units

are built for long, hard SERVICE under the most exacting conditions.

15 to 20 years and more is the usual report of RELIANCE owners, at a minimum cost for maintenance.

We offer a complete line of ROAD BUILDING and QUARRY Equipment in capacities of 50 to 1500 tons per day. Write for catalogue and prices.

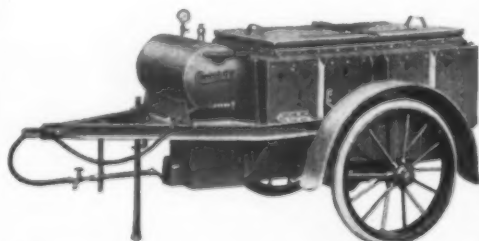
Universal Road Machinery Co.

Emerick Street

KINGSTON, N. Y.

Branch Offices in New York, Boston and Chicago

RELIANCE—THE CRUSHER WITH THE LONGER LIFE



We manufacture a full line of Tar and Asphalt Kettles, Oil Burning Kettles, Oil Burners, Torches, Pouring Pots, Hand Spraying Attachments, etc.

CONNERY'S

Style "J" Oil Burning Kettle will guard any highway with economy and efficiency. Something easy to handle and quick to heat. Equipped with standard roller bearings, springs, improved oil burner and rubber-tired wheels and heat guards if desired.

The co-operation of this organization is at your service in helping you choose the right heater for your particular requirements. Write for our little "Blue Book." It will help in the right selection.

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3996 N. SECOND ST., PHILADELPHIA, PA.



SAVES LIVES AND DOLLARS!

*Dangerous bridge approaches,
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made safe*

"Why didn't highway officials install protection there?" That's what the public asks when an accident occurs at an unprotected danger point on your highway system.

Leading highway officials are protecting motorists and building public good will by installing Cyclone Road-Guard at hazardous places. It stops heavy cars, holds them on the road. Saves many lives and reduces damage to cars.

Cyclone Road-Guard is made of strong chain link fabric, heavily galvanized. Very durable, lasts many years. Easily and quickly installed. Write for specifications and full information.

Cyclone ROAD-GUARD

CYCLONE FENCE COMPANY

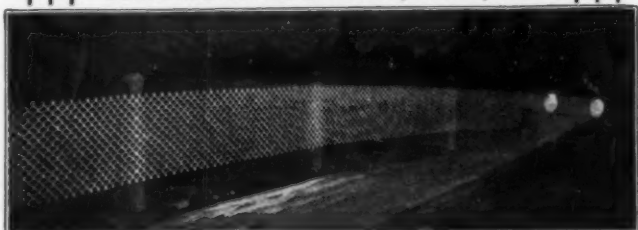
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UNITED STATES STEEL CORPORATION

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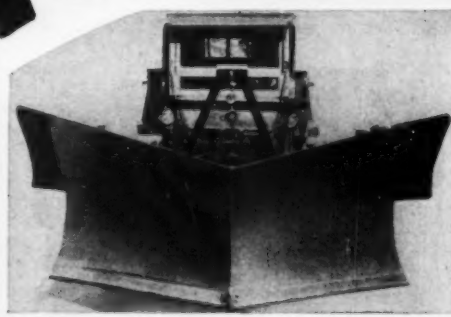
The Mark
of Quality



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CLEAR ROADS in a

HURRY!



BIG BUSTER V SNOW PLOW

Root Big Buster V Plow is designed for large trucks to replace slow moving tractors in heavy snow. Ninety per cent arc welded. Will stand punishment of two large trucks working tandem if needed. Special angle adjustment gives tendency to "dig-in", rather than climb over. Plow raised or lowered by small hydraulic hand pump located within easy reach of driver. This same pump controls the action of the extension wings, raising either wing to any position and folding or extending them to any angle. This operation is very important as wings can be used extended to full width, when meeting any vehicle either wing can be quickly folded without stopping truck. Can be operated as one-man unit.

Root Giant Spring Scrapers—Hydraulic—Reversible for maintaining earth, gravel or cinder highways will cut your maintenance costs in half and the surface of your road will be in better condition.

Manufactured and Sold by

The Root Spring Scraper Co.
Kalamazoo, Michigan, U. S. A.

Full details and prices furnished on request



TAR HEATERS

PORTABLE AND STATIONARY

See Page 96 Road and Street Catalog or write

THE JOS. HONHORST COMPANY

1016 W. 6th Street

Cincinnati, Ohio

News! The editorial columns provide you with new methods and practices in use by others in your field.

But the advertisements are no less important, for they keep you informed of advances in equipment and machinery that mean savings in construction costs.

READ THE ADVERTISEMENTS!

CLEARING HOUSE SECTION

NEW TYPE E-2

Bucyrus-Erie 1 1/2-yard Diesel
Shovel and Dragline

VERY LATEST MODEL
NEVER USED . . .
BARGAIN PRICE

Box No. 4000 Roads and Streets

15 Miles

20-Lb. 24-In. Gauge
Portable Track

15-ft. Sections on Steel Ties

Or will sell the 20-Lb. Rail
or Ties separately.

Low price—quick shipment.

ZELNICKER IN ST. LOUIS

Calls for Bids

OFFICIAL PROPOSALS

COPY for official proposals reaching our 221 E. 20th St., Chicago, office on the 5th, 15th and 25th of the month can usually be printed in the magazine issued 5 days later.

Rate: 50 cents a line an insertion

Pennsylvania Department of Highways, Harrisburg, Pennsylvania. Bids will be received December 18, 1930, for the construction of 13 road projects, totaling approximately 24 miles; construction to be grading and drainage, foreign borrow surfacing, macadam, bituminous "E" on broken stone base and reinforced concrete; also for the construction of 3 bridges to be reinforced concrete arch, superstructure to be through truss and deck girder and one to be structural steel and reinforced concrete. Projects situated in the following counties:

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Allegheny
(Bridge)
Armstrong
(Bridge)
Chester
Delaware

Fayette
Greene
Indiana
Indiana (Bridge)
Montgomery
Schuylkill
Venango

Full particulars upon application to James L. Stuart, Secretary of Highways, Harrisburg, Pennsylvania.

WANTED

Used Concrete Mixer and Gravel
Screen. Large size.

ARTHUR V. LEY

912 Grant Place, Washington, D. C.

Snow Removal Machine

of simple construction, and efficient operation will meet a great demand, needed in every community. Write for further information.

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Advertise in
the Clearing House

SAVE 20% ON ALL
TRANSITS and LEVELS
Annual Clearance Sale
Transits and levels rebuilt by makers of
"Sterling" Surveying Instruments. Sold subject
to rigid field test. Cash or deferred payment.
ACT NOW!
Write TODAY for new list RSC-412
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Sell Your USED EQUIPMENT

*Before the storage and depreciation on
it eat up the profits on that last job.*

USE OUR CLEARING HOUSE SECTION

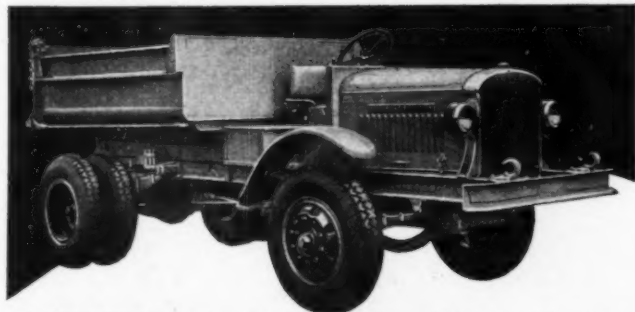
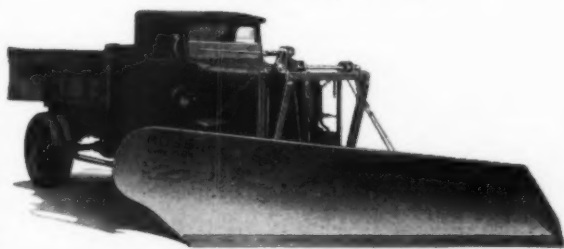
WHEN BUYING A SNOW PLOW

—Why Not Buy a
ROSS

It is guaranteed to clear any road and
fit any truck.

GET OUR NEW CATALOG

THE BURCH CORP.
CRESTLINE, OHIO



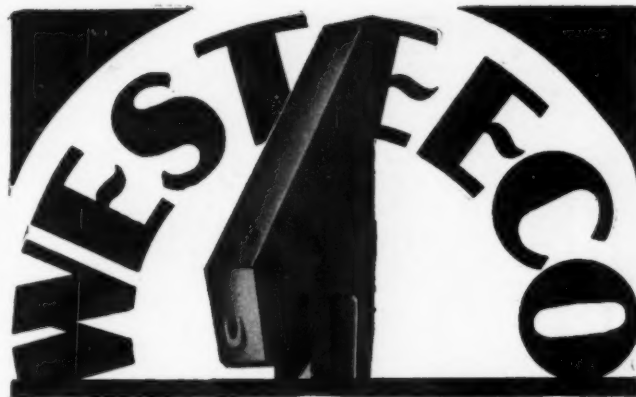
BUILT to Do the Job

THE Hug Roadbuilder does everything a Roadbuilder truck is expected to do. No matter where the job, what operating conditions might be, how tough the problem—the Hug performs the work it is designed to do—builds roads efficiently with low operating cost. That's why it's the popular choice of roadbuilders and contractors.

Hug Roadbuilder Trucks will be exhibited at the A.R.B.A. Road Show in Saint Louis, January 12 to 16, space B-35. You are cordially invited to inspect the latest models of modern Roadbuilding Transportation Units.

HUG

THE HUG CO., Highland, Illinois



TRY WESTECO DIPPER TEETH

Westeco's are made from our own special steel so alloyed that they—wear longer—stand more shock and have a greater resistance to abrasive wear.

For Complete Information Write to

WESTERN CRUCIBLE STEEL CASTING CO.
2833 GRAND AVE. MINNEAPOLIS



ANTHONY DUMP BODIES

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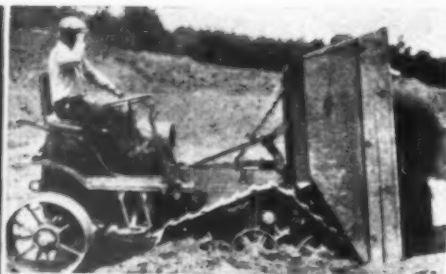
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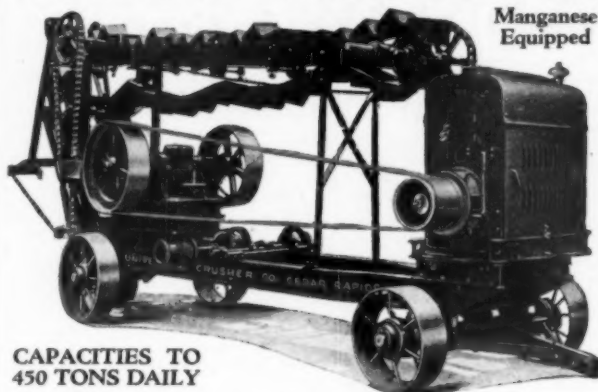
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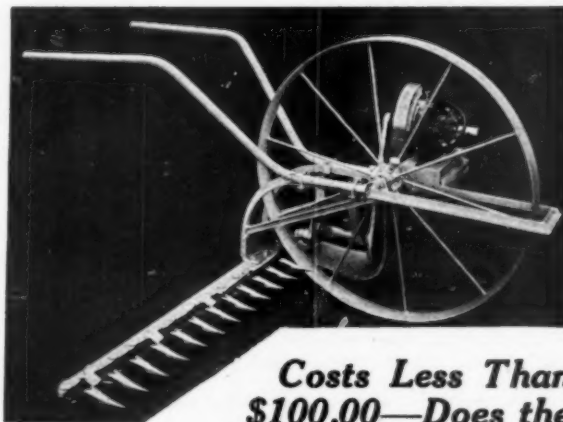
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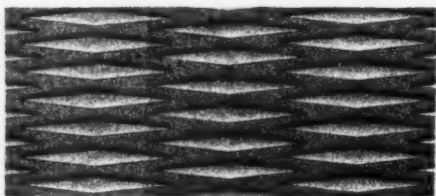
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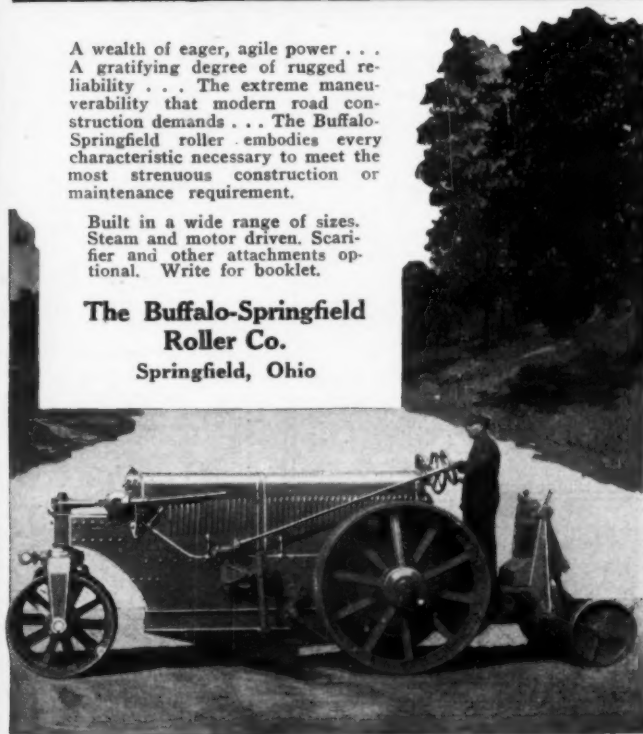
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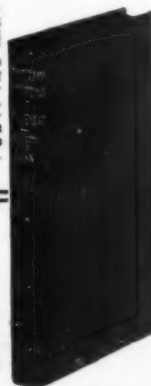
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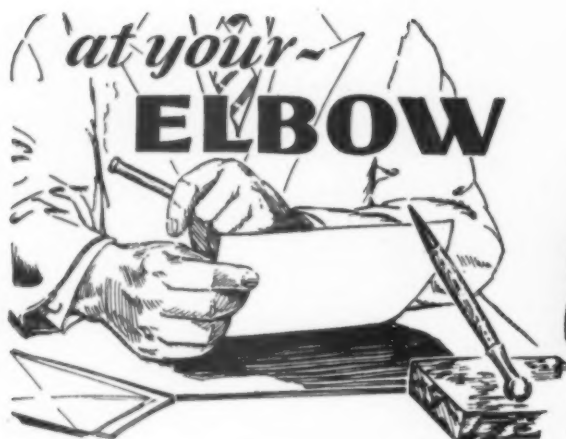
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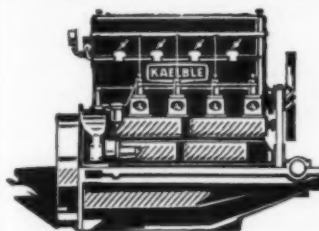
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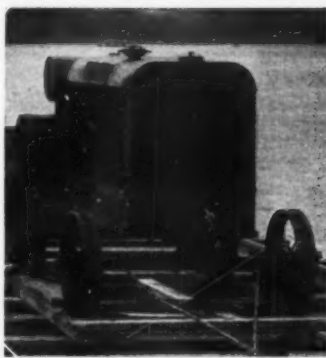
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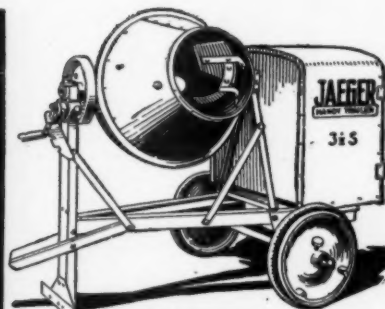
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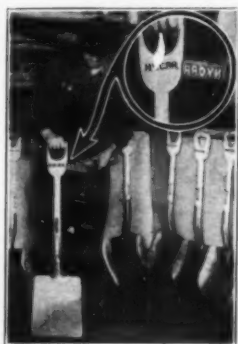
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